EPA WORK ASSIGNMENT NUMBER 189-4L15
UNDER
CONTRACT NUMBER 68-01-7250

FIELD OPERATIONS PLAN

BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA

MARCH 1988

NOTICE

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FIELD OPERATIONS PLAN

BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA

PART A - FIELD SAMPLING AND ANALYSIS PLAN

PART B - HEALTH AND SAFETY PLAN

EPA WORK ASSIGNMENT NUMBER 189-4L15
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FIELD SAMPLING AND ANALYSIS PLAN

BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA

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1.0 INTRODUCTION

This Field Sampling and Analysis Plan (FSAP) for the Bluff Road Site, Richland County, South Carolina, is an integral part of the Remedial Investigation/Feasibility Study (RI/FS) work plan. Whereas the work plan develops the RI/FS objectives and scope and defines what activities will occur, the FSAP concentrates on how the various field activities will be performed and provides detailed sampling and quality assurance/quality control (QA/QC) procedures for sample collection, handling, and shipping.

1.1 SITE LOCATION

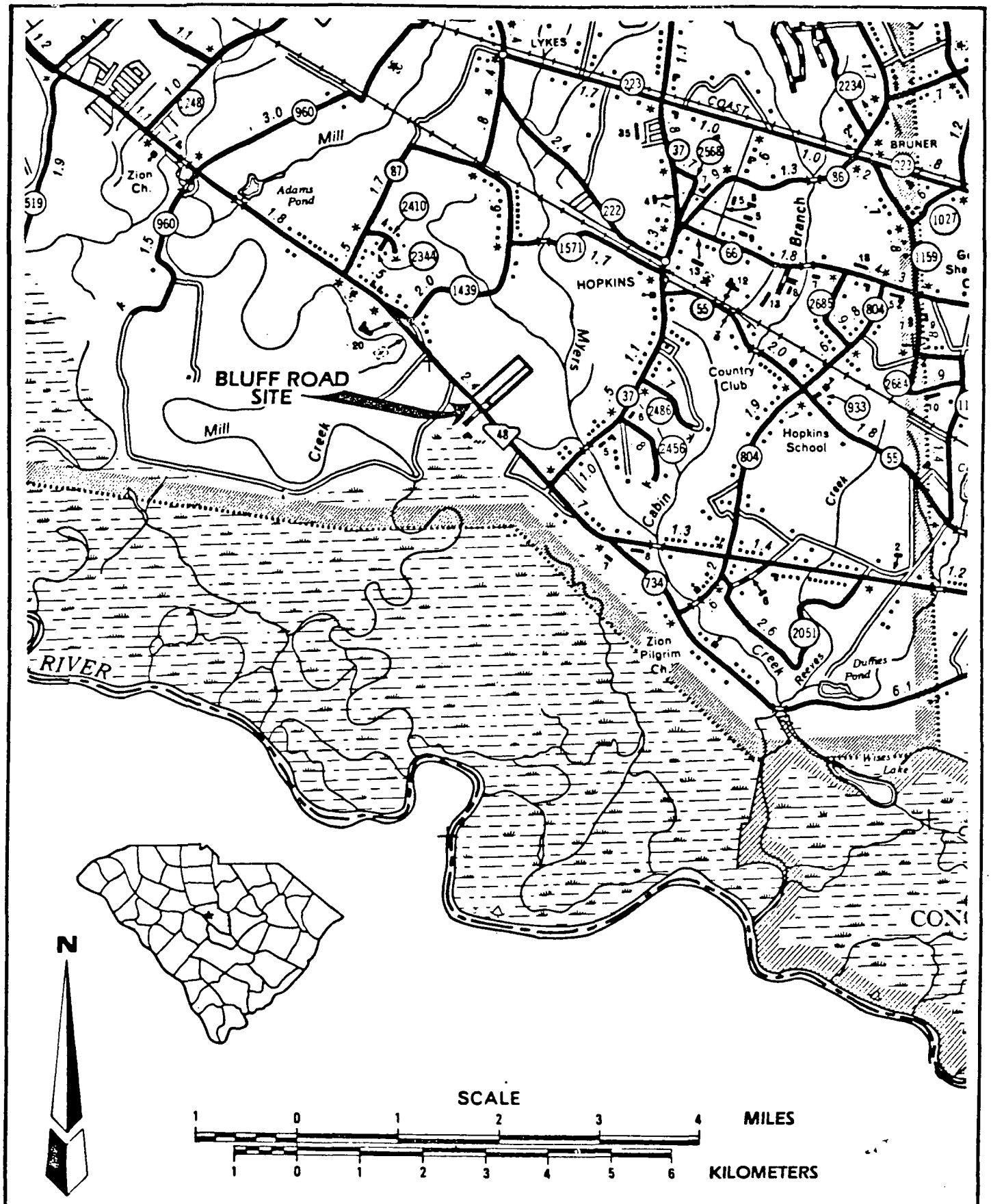
The Bluff Road Site, alternately referred to as South Carolina Recycling and Disposal, Inc. (SCRDI) is located on South Carolina Highway 48, approximately 10 miles southeast of Columbia, and 10 miles northwest of Gadsden in Richland County (Figure 1). The site is bordered by South Carolina Highway 48, also known as Bluff Road, on the southwest side. The rest of the site is surrounded by a sparsely populated rural setting. The Bluff Road site is sited adjacent to a parcel of property known as Campbell's Garage. This property and the buildings located on it are now abandoned. During previous drum removal activities, part of this site was used as a drum staging area.

1.2 SITE HISTORY

The Bluff Road Site consists of an abandoned chemical waste recycling and disposal area sited on about four acres, of which two acres were actually used for waste material storage (Figure 2). The study area was the site of extensive disposal activity from 1976 to 1982. Prior to SCRDI's operations, the site was used as an acetylene manufacturing facility.

The Bluff Road Site was included on the National Priorities List (NPL) in October 1981. At the time of NPL listing, approximately 7,200 drums of toxic, flammable and reactive wastes were stored on-site, as well as numerous smaller containers. Two small lagoons near the center of the site are remnants of lime slurry disposal used by the acetylene manufacturer.

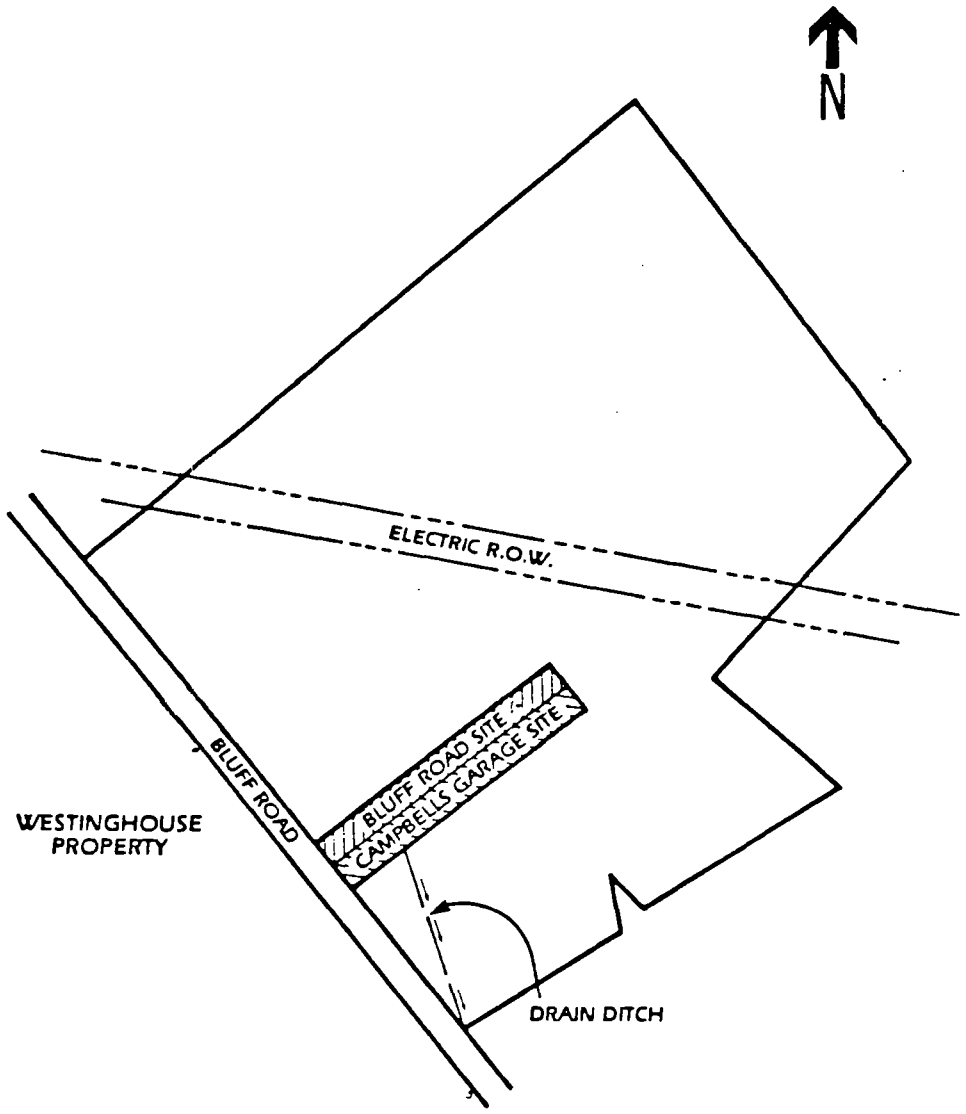
The first investigation conducted on the Bluff Road site was performed by the Surveillance and Analysis Division of the U.S. Environmental Protection Agency (EPA). Results



EBASCO

REM III
LOCATION MAP
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE
1-1



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REM III

SITE MAP

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE

1-2

are described in their report entitled "Groundwater and Surface Water Investigation, South Carolina Recycling and Disposal, Inc., Bluff Road Site, Columbia, South Carolina," July 1, 1980. During their site visit (March 1980), the investigators noted "numerous examples of spillage and/or leaking drums in the drum storage area," "chemical spillages exist in direct contact with water pooled in the old filled lagoon," and "badly contaminated surface water drains directly to a swampy area adjoining the site." Fourteen samples were obtained which included soil samples from the Bluff Road site, water and sediment samples from drainage features near the site, water samples from local water wells, and water and sediment samples from Myers Creek.

A variety of metals were present in soil and water samples collected on and around the Bluff Road site. Possible sources of the metals include deteriorated drums, natural soil metals, and waste lime, as well as spilled hazardous wastes. Surface water and sediment samples from the onsite lagoon area showed elevated levels of calcium when compared to the other samples (Figure 3-2). Water from the Bluff Road well exceeded secondary water quality standards for iron and manganese and approached primary drinking water standards for lead. EPA concluded that the sediment and water samples from Myers Creek, (Figure 1-1) were within normal ranges.

Organic compounds found in surface water and soil samples from the Bluff Road site included phthalates, pesticides, other aromatic compounds including chlorinated benzene and phenols, and other compounds tentatively identified as organics by EPA. Volatile organic compounds were not found in the surface soils, although drums of volatile compounds were observed to be leaking. Volatile organics were found in surface water samples. Traces of phthalates were found in both surface water and groundwater. A trace of dieldrin was found in the Campbell's Garage well, which EPA proposed may have been due to termite or ant control practices.

Groundwater conditions at the site were investigated by the South Carolina Department of Health and Environmental Control (SCDHEC) and described in their report entitled "Investigation of Groundwater at South Carolina Recycling and Disposal Company, Bluff Road Site, Richland County, South Carolina," (January 1981). Investigators installed 11 shallow monitoring wells around the Bluff Road Site and

Campbell's Garage with screened intervals varying between 9 feet and 22 feet in depth. Water level measurements indicated a shallow, relatively flat water table, with flow to the east and northeast.

Initial groundwater quality sampling was performed by SCDHEC in September 1980. Specific conductance of the water samples varied from 20 to 1500 umhos/cm with a pH between 5.0 and 6.0. Lead was found in many wells in excess of drinking water standards (0.05 ppm). Volatile organic compounds were found in many wells. Some of these compounds may be attributable to the use of PVC solvent cement in well construction used by SCDHEC. However, both the number of volatile organic compounds and the concentrations were greatest in wells downgradient of the Bluff Road Site and Campbell's Garage. These results led SCDHEC to conclude that groundwater contamination existed at the site and was moving at a relatively slow rate to the northeast and southeast.

Groundwater sampling was again performed by SCDHEC in August 1982, and the results published as an addendum to their 1981 report. Resampling showed an increase in both the number and concentration of volatile organic compounds, leading SCDHEC to conclude that the groundwater quality surrounding the site continued to be degraded.

Golder Associates was retained by SCDHEC to conduct a Remedial Investigation at the site to determine the type, extent, and degree of soil and groundwater contamination on and around the site. In November 1984, Golder Associates began the Remedial Investigation which included a surface geophysical survey, a soil gas survey, soil sampling, and groundwater monitoring. These tasks were completed in December 1985. In January 1986, treatability studies were conducted on contaminated soil and groundwater samples collected from the site.

In 1987, Camp Dresser and McKee Federal Programs Corporation was tasked with reviewing the Golder Associates RI Report, defining data gaps, and generating RI/FS documents under the REM II contract for an RI/FS Superfund investigation.

In September 1987, a REM III Work Assignment to Ebasco Services Incorporated was initiated from EPA Region IV, to implement an RI/FS investigation for the Bluff Road site. This work was limited to development of a Work Plan and Field Operations Plan.

1.3 SITE DESCRIPTION

1.3.1 Topography, Surface Water, and Drainage

The study area is located in a flat low-lying area between South Carolina Highway 48 (Bluff Road) and Myers Creek (Figure 1-1). Bluff Road, which bounds the southwest side of the study area, is a local topographic high. The land west of Bluff Road slopes toward the west, draining into the Congaree River and Mill Creek. The land east of Bluff Road, which includes the study area, slopes gently eastward toward Myers Creek, a tributary of the Congaree River. Wooded land outside the former facility boundary commonly has ponded water in many areas for several days after a heavy rainfall. Property east of Myers Creek drains westward back into the creek. Myers Creek flows through a broad, swampy area where soft soils and standing water are common.

1.3.2 Geology

This section presents a brief overview of the geology at and around the Bluff Road Site.

The Bluff Road Site is located in the Upper Coastal Plain physiographic province. In this area sedimentary deposits of Cretaceous and Tertiary Age overlie older crystalline rocks. Because the site is located near the Fall Line (the landward boundary of the Upper Coastal Plain) the sediments are thinner than those closer to the coast. Also, many formations present near the coast are not found among the sediments near the site. The major stratigraphic units present in the region are the Okefenokee, Black Mingo, and Middendorf Formations.

The surficial soils in the vicinity of the site consist of terrace deposits of the Okefenokee Formation. They are water deposited, irregularly interbedded deposits of sand, gravel, and clayey sands. The surficial sands are underlain by the Black Mingo Formation. Regionally the formation consists of an upper portion of dense, massive gray clay and a lower portion of coarse-grained, cross-bedded sands. The predominant clay mineral in the upper portion is montmorillonite with quartz, opal, calcite, and mica minerals also being present. The lower

portion of the Black Mingo Formation consists of coarse-grained sands sometimes containing glauconite. These sands are very similar to those in the underlying sediments.

The Middendorf Formation is the deepest of the sediments in the region and directly overlies the crystalline rocks. Near the Fall Line the formation was deposited in a fluvial environment and consists of irregularly interbedded sand and gravel, light colored feldspathic and kaolinitic sands, and lenses of kaolin. Some upper beds exhibit a distinctive purple and white mottling.

1.3.3 Hydrogeology

The hydrogeology of the sediments in the region is relatively simple. The surficial sand is the uppermost aquifer of the region. Recharge is by infiltration of rainfall from the ground surface. Water in this aquifer is typically slightly acidic with low total dissolved solids. However, natural iron concentration may exceed drinking water standards in some locales. Yields from this surficial aquifer are generally sufficient for domestic use. The clay underlying the surficial sands is an aquitard restricting the downward flow of groundwater from the surficial aquifer and serving as a confining layer for underlying aquifers. The sands of the lower Black Mingo and Middendorf Formations are very similar and are hydraulically connected. These strata constitute a confined aquifer. This is an important aquifer in the region with yields generally sufficient for irrigation or industrial use. Water quality is suitable for most purposes. The aquifer is primarily recharged in the Formation's outcrop area near the Fall Line.

1.4 OVERVIEW OF FIELD ACTIVITIES

Various field investigations will be conducted to collect the data necessary to meet the RI/FS objectives (see Section 3.0 of the Work Plan). Provided below is a brief description of the activities that will be conducted during the RI at the Bluff Road site. Detailed descriptions of the procedures which will be used to accomplish these tasks are given in Section 3.0 of this FSAP. The investigations have been planned using the existing data as a preliminary basis for the numbers and locations of all investigative

tasks. Adjustments to these proposed investigations may be made during the RI as additional data become available. Such adjustments would result from discussions among the Field Operations Leader (FOL), Site Manager (SM), Regional Manager (RM), and the EPA Remedial Project Manager (RPM).

1.4.1 Preliminary Activities

Preliminary activities will be conducted during a field visit prior to initiation of the RI. This will allow assigned personnel to become familiar with the site's physical characteristics so that accurate placements of site trailer, decontamination area, and drill staging area can be determined.

Off Site Access:

- Tax maps will be obtained so that property ownership may be established for off site sampling and well drilling tasks.
- A list of important local telephone numbers and addresses will be obtained (i.e., electrical contractors, phone company, organic free water system, etc.).

Property Reconnaissance:

- The entire Bluff Road Site will be visually inspected to identify waste disposal areas, above and below ground tanks, leachate seeps, or other areas of interest which may require investigation.

1.4.2 Site Screening

Site screening activities will be the initial field tasks conducted during the RI. Site screening activities will include air quality monitoring, private well inventory, surface soil screening, and groundwater screening.

Air Quality Monitoring:

- The on-site air quality monitoring investigations will encompass two regimes of air quality monitoring to meet the following objectives: (1) general site survey to establish and verify levels

of personnel and public protection; and (2) target area survey to qualitatively identify potential sources of organic vapor emissions.

Private Well Inventory:

- An inventory of private wells will be compiled for wells located along South Carolina State Route 37 and any other potentially affected wells downgradient of the site.

Surface Soil Screening:

- Soil samples will be collected at the surface from within the site area, the adjacent drum staging areas, downgradient of the site, and immediately upgradient of the site. Samples from the soil screening task will be sent to a local laboratory for quick turnaround analysis. Sample analysis will provide guidance for locating temporary soil borings and monitor wells which will be completed during site characterization. Surficial soil data will be used to assess the risk of dermal contact with soils by persons in the area.

Groundwater Screening:

- Twenty-five groundwater samples will be collected from existing monitor wells installed by Golder & Associates and analyzed for indicator parameters by a local laboratory for quick turnaround service. These data will aid in determining the rate at which the groundwater contaminate plume is migrating and provide guidance for new monitor well locations.

  In addition to the 25 existing wells, 16 groundwater samples will be collected from shallow (surficial aquifer) temporary wells to better define the extent of the groundwater plume migrating from the site. These samples will also be analyzed by a local laboratory for quick turnaround service. The samples will be analyzed for VOC and metals. These data, combined with existing monitor well samples, will provide for more accurate placement of new permanent monitor wells.

1.4.3 Site Characterization

Site characterization activities will be undertaken at the conclusion of screening activities without demobilization of the field team. Soil borings and monitor wells within the study area will provide geologic, hydrogeologic, and engineering information on the identity and concentration of contaminants within and migrating from waste disposal areas via soil or groundwater.

Subsurface Soil Investigation:

- Twenty-nine soil borings will be performed to better define the lateral and vertical extent of contamination and provide a site specific geologic profile for the site. The soil borings will be advanced to the top of the uppermost aquifer and the elevation of the aquifer determined. The location of each boring will be determined from the results of the site screening task. Split-spoon samples will be collected every five feet to the water table of the uppermost aquifer; an estimated 87 samples will be sent to a local laboratory for TCL analyses. Four soil borings will be sited so as to be completed as shallow monitor wells. It is expected that the soil borings will not extend deeper than 15 feet. The soil sampling analysis will provide a better determination of the extent of soil contamination.

Surface Water and Sediment Investigation

- To obtain data necessary to define the contaminant loadings from the site to Myers Creek and the Congaree River, surface water and sediment sampling will be performed at seven locations. Sediment samples will be collected from any surface run-off areas within the site boundaries and analyzed by a CLP laboratory.

Lagoon Sampling:

- Surface water and sediment samples will be collected from the onsite lagoon to better define the type and degree of contamination present. In addition, subsurface hand auger soil samples of

material within the on-site lagoon and closed lagoon will be sampled and analyzed, to determine the hazardous nature of the material. All samples will be sent to a CLP laboratory for the analyses.

Groundwater Investigation:

- Seventeen shallow two-inch nominal diameter stainless steel monitor wells will be installed on or near the site to determine the extent of the contaminant plume in the surficial aquifer.

- Four deep monitor wells constructed of two-inch nominal diameter stainless steel will be installed in the deep confined aquifer to determine if contamination has entered this aquifer.

- Four Shelby tube samples will be taken from the Black Mingo Clay Formation and sent for laboratory determination of permeability and cation exchange capacity. Particular attention will be paid to ascertaining what effect the organic chemicals present in the groundwater will have on the ability of the clay to act as an aquitard. This information will be useful in determining the potential for groundwater contamination and the feasibility of remedial alternatives.

- Each of the 21 new monitor wells will be sampled once. These samples will be sent to a CLP laboratory for TCL analyses so that groundwater quality can be established.

- Slug tests will be performed in all new monitor wells to determine the hydraulic conductivity of each aquifer.

- Water levels will be collected from all newly installed monitor wells, as well as all existing wells so that groundwater flow direction can be determined.

- These data obtained from Shelby tube analysis, slug testing, and static water level measurements will be used for determining vertical groundwater gradients in the surficial aquifer and through the clay aquitard underlying the surficial sand aquifer.

Aquatic Biota Survey:

- o Determine the abundance and diversity of fish and benthic macroinvertebrates in the streams at the seven surface water sampling stations.
- o Fish specimens will be collected from the streams, where possible, at the seven surface water sampling locations.
- o Benthic macroinvertebrate organisms collected will be identified to a general level to determine diversity index, tolerance categorization, and counted to determine abundance.
- o Inventory fish and benthic macroinvertebrates and determine in-situ measurements of pH, temperature, and conductivity at the seven surface water sampling locations.

2.0 GENERAL FIELD OPERATIONS

2.1 MOBILIZATION ACTIVITIES

Following the approval of this FSAP, arrangements will be made for a field trailer to be placed at the site. A field sampling crew will be scheduled and sampling and health/safety equipment shipped to the site. Electricity, telephone, and port-a-john services will be installed. A deionized/organic-free water system will be installed at the field trailer for decontamination of equipment.

The sampling crew will be thoroughly familiar with this FSAP and EPA Region IV Environmental Services Division (ESD) Standard Operating Procedures (SOPs) prior to initiating the investigation.

2.2 FIELD TEAM PERSONNEL AND RESPONSIBILITIES

The overall project organization and responsibilities of key personnel are discussed in the Site Management Plan. The onsite direction of the field team will be the responsibility of the Field Operations Leader (FOL) who will report directly to the Site Manager. The Health and Safety Officer (HSO) will interact with field team members

regarding onsite activities. Section 2.0 of the Site Management Plan (SMP) presents the names and responsibilities of key field team personnel.

2.3 PERSONAL PROTECTION

A site-specific Health and Safety Plan (HASP) has been prepared as part of the Field Operations Plan (FOP). Section 8.2 of the HASP, Personal Protection, provides information regarding the required levels of protection for various tasks. Section 11.0 of the HASP details personal decontamination procedures.

2.4 FIELD TECHNICAL GUIDANCE

The primary source of technical guidance to be used during field activities at the Bluff Road Site is the 1986 EPA Region IV Environmental Services Division (ESD) Standard Operating Procedures (SOPs). These guidance documents are referenced whenever possible in the description of the field procedures. Minor modifications to the procedures provided in the guidance are occasionally necessary to meet site conditions. These modifications are described when the procedures are referenced in Section 3.0 of this FSAP. Copies of the referenced sections of the documents will be kept in the field trailer and reviewed with the field team before each task.

2.5 FIELD AND ESD QUALITY CONTROL SAMPLES

Quality control (QC) samples generated for laboratory analyses during the RI will include duplicate samples, trip blanks, and field (or equipment) blanks. QC blanks and spiked samples will also be provided by the ESD.

One of every 10 samples of each medium will be duplicated. Field (or equipment) blanks will be prepared each day that equipment is decontaminated from a composite of the final deionized/organics-free water rinse of equipment decontamination and will be analyzed for TCL compounds. In addition, a trip blank for volatile organic analysis only will be submitted with each shipment of samples.

The ESD will also provide QC samples to be submitted to the CLP laboratory with the Bluff Road samples. The ESD will typically provide spiked samples (soil or water) and QC blanks. The number, type, and analytic parameters of these samples are determined by the ESD.

Table 2-1 summarizes the number of samples expected to be collected during each task and the number of duplicates, trip blanks, and field blanks. The number of ESD-generated QC samples is not included on this table since this is determined by the ESD and added to the CLP laboratory request by the ESD. Also shown on Table 2-1 is the type of analyses to be performed, the analytical method, and the data quality objective (DQO) level required.

2.6 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are established to ensure that the data collected are sufficient and of adequate quality for their intended uses. Four data quality levels are typically recognized: Levels I through IV.

Level I data can be collected using portable instruments and is typically used for gross engineering determinations or for health and safety screening. Level II data are the result of field analyses using portable instruments or mobile laboratories that are not generally subject to strict QA/QC procedures. These data can be used to determine the presence or absence of specific pollutants or for screening to determine sampling locations. Level III data are generated by non-CLP laboratories using standard EPA analytic methods. Level III data can be used for remedial design. Level IV data are generated by laboratories using the CLP analytic protocol. Level IV data are often required for risk assessment or in situations where legally defensible data with extensive QA/QC are necessary.

At the Bluff Road site, a lower data quality level is necessary for screening activities than is necessary for data intended for use in the risk assessment. Based on this consideration, data quality levels for each sampling activity at the Bluff Road Site have been established as outlined in Table 2-1.

TABLE 2-1
SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Surface Soil Samples	34-soil	3	1	1	39	Ext. org, pest, PCB, volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Surface Soil Sample Splits	3-soil	1		1	5	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Existing Monitor Well Groundwater Samples	25-water	2	1	1	29	Volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Existing Monitor Well Groundwater Sample Splits	2-water			1	3	Ext, org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Surface Water Samples	7-water	1	1	1	10	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Sediment Samples	7-soil	1	1	1	10	Ext. org, pest, PCB, volatile organics metals, cyanide	CLP	RAS	IV

Note: A full set of analyses will be performed as poart of the trip blank.

TABLE 2-1 (Continued)
SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Lagoon Surface Water Samples	3-water		1		4	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Lagoon Sediment Samples	3-soil		1		4	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Lagoon Soil Samples	6-soil	1	1	1	9	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Groundwater Temporary Wells	16-water	1	1	1	19	Volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Split Spoon Samples	87-soil	9	1	1	98	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	III

*If conditions permit

Note: A full set of analyses will be performed as poart of the trip blank.

TABLE 2-1 (Continued)
SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Split Spoon Sample Splits	9-soil	1	1	1	12	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Groundwater Samples New Monitor Wells	21-water	2	1	1	26	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
*Runoff Sediment Samples	5-soil			1	6	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV

*If conditions permit

Note: A full set of analyses will be performed as part of the trip blank.

2.7 SAMPLE IDENTIFICATION AND CHAIN OF CUSTODY

Each sample collected will have its own number, which will apply during the entire project. The sample numbers will consist of a four-faceted alpha-numeric code, which will identify the project, type of sample, the sample location, and the number of samples collected at the location.

The sample types are:

MW - Monitoring Well	SW - Surface Water
SS - Surface Soil	SB - Soil Boring
SD - Sediment	TB - Trip Blank

Each location will have a two-digit number (i.e., 01, 02, etc.) followed by a series number (the series number would identify the number of samples obtained from a particular location). For example, the first time monitor well MW-09 (Bluff Road site) is sampled, the number for the sample shall be:

BR-MW-09-1.

If it is sampled again at another time, the sample number would become:

BR-MW-09-2.

For soil borings, the two digit number designating the boring location will be followed by a sample depth range in parenthesis. A sample collected at soil boring -01 from a depth range of 0-2 feet would be designated:

BR-SB-01(0-2)-1.

For duplicates, the letter designation D will be used following the sample type designation. For example, a duplicate sample from soil boring no. 5 taken at a depth of a depth range of 10-12 feet will be:

BR-SBD-05(10-12)-01.

If a duplicate is taken at that point again, the number would become:

BR-SBD-05(10-12)-02.

Spiked samples provided by ESD will be assigned the same type designation as the medium that the spiked sample represents. The spiked sample will not be able to be distinguished from other samples. The spiked sample will be identified on the ESD and sample management traffic reports and chain of custody only. Spiked sample codes will also be recoded in field sampling log books.

Blank samples will be assigned designations in the same manner as spiked samples.

Chain-of-custody procedures are outlined in Section 3.3 of the ESD SOPs. The procedure will be used with no modification.

2.8 SAMPLE CONTAINER REQUIREMENTS, PRESERVATION, AND HOLDING TIMES

Sample container, preservation, and holding time requirements are specified in Appendix A of ESD SOPs. Table 2-2 lists the proposed totals of each type of sample to be collected, as well as the associated container, preservation, and holding time requirements. All samples requiring preservation will be preserved within the time frames indicated in the SOPs.

2.9 SAMPLE SCHEDULING, PACKAGING AND SHIPPING

Samples will be packaged and shipped in accordance with procedures presented in Appendix C of the ESD SOPs. The Site Manager will be responsible for coordinating with the RPM who will contact the EPA Regional Sample Center Coordinator (RSCC) for scheduling each shipment of samples. The RPM will be contacted at least two weeks before each sampling episode and arrangements made to have CLP sample spaces reserved. The REM Laboratory Coordinator will arrange for preparation of spikes and/or blanks and picking up same. The RPM will be informed of any changes in the number or types of samples as the changes occur. The SMO will be contacted by the FOL on the day of each shipment of samples and provide the following information:

- Dates the samples were shipped
- Types of samples
- SMO Case Number
- Number of Samples
- Airbill Number
- Laboratory to which the samples were shipped

TABLE 2-2

SAMPLE BOTTLE, PRESERVATION AND HOLDING TIME REQUIREMENTS FOR EACH SAMPLING TASK

BLUFF ROAD SITE

COLUMBIA, SOUTH CAROLINA

Sampling Task	Total No. of Samples and Media	Analyses	Holding Time	Preservation Requirements	BOTTLE REQUIREMENTS Per Sample	Total
Surface Soil Samples	44-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celcius	8-oz. glass	44
		volatile organics	14 days	Cool, 4 degrees celcius	4-oz. glass	44
		metals, cyanide	6 months	Cool, 4 degrees celcius	8-oz. glass	44
Existing Monitor Well Groundwater Samples	32-water	Volatile organics	14 days	4 drops concentrated HCL Cool, 4 degrees celcius	3 40-ml vials	96
		metals	38 days	50% nitric acid, pH <2	1-liter polyethylene	32
		cyanide	14 days	NAOH to pH >12	1-liter polyethylene	32
Surface Water Samples	10-water	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius		10
		volatile organics	14 days	4 drops concentrated HCL Cool, 40 degrees celcius	3 40-ml vials	30
		metals	38 days	50% nitric acid, pH <2	1-liter polyethylene	9
		cyanide	14 days	NAOH to pH >12	1-liter polyethylene	9
Sediment Samples	10-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	8-oz. glass	10
		volatile organics	14 days	Cool, 4 degrees celsius	4-oz. glass	10
		metals, cyanide	6 months	Cool, 4 degrees celsius	8-oz. glass	10
Lagoon Surface Water Sample	4-water	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius		4
		volatile organics	14 days	4 drops concentrated HCL Cool, 40 degrees celcius	3 40-ml vials	12
		metals	38 days	50% nitric acid, pH <2	1-liter polyethylene	3
		cyanide	14 days	NAOH to pH >12	1-liter polyethylene	3

Note: All sample containers for organic samples will have Teflon lined caps.

TABLE 2-2 (Continued)
SAMPLE BOTTLE, PRESERVATION AND HOLDING TIME REQUIREMENTS FOR EACH SAMPLING TASK
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

Sampling Task	Total No. of Samples and Media	Analyses	Holding Time	Preservation Requirements	BOTTLE REQUIREMENTS Per Sample	Total
Lagoon Sediment Sample	4-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	8-oz. glass	4
		volatile organics	14 days	Cool, 4 degrees celsius	4-oz. glass	4
		metals, cyanide	6 months	Cool, 4 degrees celsius	8-oz. glass	4
Lagoon Soil Sample	9-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	8-oz. glass	9
		volatile organics	14 days	Cool, 4 degrees celsius	4-oz. glass	9
		metals, cyanide	6 months	Cool, 4 degrees celsius	8-oz. glass	9
Groundwater	19-water	Volatile organics	14 days	4 drops concentrated HCL Cool, 4 degrees celcius	3 40-ml vials	57
Temporary Wells		metals	38 days	50% nitric acid, <2 pH	1-liter polyethelene	19
		cyanide	14 days	NAOH to pH >12	1-liter polyethelene	19
Split Spoon Samples	110-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	8-oz. glass	110
		volatile organics	14 days	Cool, 4 degrees celsius	4-oz. glass	110
		metals, cyanide	6 months	Cool, 4 degrees celsius	8-oz. glass	110
Groundwater Samples New	26-water	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	1-gal. amber glass	26
		volatile organics	14 days	4 drops concentrated HCL Cool, 4 degrees celcius	3 40-ml vials	78
Monitor Wells		metals	38 days	50% nitric acid, <2 pH	1-liter polyethylene	23
		cyanide	14 days	NAOH to pH >12	1-liter polyethylene	23
Runoff Sediment Samples	6-soil	Ext org, pest, PCB	7 days	Cool, 4 degrees celsius	8 oz. glass	6
		volatile organics	14 days	Cool, 4 degrees celsius	4-oz. glass	6
		metals, cyanide	6 months	Cool, 4 degrees celsius	8 oz. glass	6

Note: All sample containers for organic samples will have Teflon lined caps.

For purposes of scheduling, the ESD and SMO will track sample shipment, receipt, analysis, and data validation and will be responsible for forwarding this information to the potentially responsible parties (PRP). Local laboratory samples will be packaged and shipped in the same manner as CLP samples.

2.10 DOCUMENTATION

Bound, weather-proof field notebooks will be maintained by the field team. Team members shall record all information related to sampling time, weather conditions, unusual events (well tampering), field measurements, etc.

In addition to the field notebooks, a site logbook shall be maintained by the FOL. Essentially, this book will contain a summary of the day's activities and will reference the field notebooks when applicable. Various field reports will also be maintained.

2.11 FIELD AUDITS

Quality Assurance (QA) performance audits will be performed by EPA Region IV Environmental Services Division personnel during the remedial investigation. The audits will include checks on adherence to all sampling protocols. Audit findings will be documented and distributed to appropriate project team members.

2.12 PROCEDURES FOR FIELD CHANGE AND CORRECTIVE ACTION

Corrective action may be initiated as a result of audits, field observations, or complaints. All changes or deviations from this FSAP must be documented in the field notebook. The FOL shall contact the Site Manager, or designee, and explain the reason for the deviation or change. After discussing the situation with the Site Manager, corrective action will be determined and initiated.

For significant field changes, as determined by the SM, the EPA RPM will be notified for resolution prior to implementation.

2.13 FIELD INSTRUMENTATION

Numerous monitoring instruments will be used during activities and may include the following:

- o Organic vapor analyzer
- o Temperature probe
- o Conductivity meter
- o pH meter
- o Photoionization meter
- o Electronic water level meter

Each device will be calibrated according to the manufacturer's operating manual prior to each day's use. Calibration will be documented on an equipment Calibration Log (FT-13.02). During calibration, an appropriate maintenance check will be performed on each piece of equipment. If damaged or failed parts are identified during the daily maintenance check and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until the identified parts are repaired or replaced.

2.14 DECONTAMINATION PROCEDURES

All equipment will be decontaminated using the procedures outlined in Appendix B of the ESD SOPs. An organic free water purification system will be set up at the site to provide a consistent supply of organics-free water (as defined in Appendix B of the ESD SOPs) for the decontamination process.

All effluent tubing and fittings of the water purification system will be constructed of teflon^{R} or stainless steel. Samples of the organics-free water will be analyzed for the TCL components once during each week of field work. The first sample will be submitted for analyses on a quick turnaround basis to confirm proper operation of the system. Arrangements will be made to have access to tap water (installed on site). Glass jugs and teflon^{R} tubing will be used to pour the organics-free water over the

equipment during rinsing. Teflon^{R} spray bottles will be used whenever possible to apply the pesticide grade isopropanol.

One decontamination (decon) station will be set up within the Study Area. The station will include a decon/drying table constructed of wood and lined with aluminum foil, and a number of galvanized metal tubs. The table will be constructed such that decon rinse solutions will run off the table and drain onto the ground. The equipment will first be scrubbed in a tub of detergent solution and rinsed with tap water in another tub. The piece of equipment will then be placed on the table and rinsed as described in Appendix B of the ESD SOPs. Equipment will be allowed to air dry on the table or moved into the trailer to dry and then wrapped in aluminum foil as described in the SOPs.

The isopropanol will be captured in wash tubs or 55 gallon drums separately (by the design of the decon table) and allowed to evaporate or will be containerized in 55 gallon drums if so warranted. Rinse water and detergent solution will be discharged onto the ground at designated locations.

Any portion of the drill rig that is over the borehole (kelly or mast, drilling platform, hoist or chain pulldowns and head or cathead, etc.) will be steam cleaned and wire brushed before being brought onsite to remove all rust, soil and other material (which may have come from other hazardous waste sites). The drill rig will then be inspected to insure that all oil, grease, hydraulic fluid, etc. has been removed, all seals and gaskets are intact and no fluids are leaking. Steam cleaning of the drill rig is then required prior to drilling each borehole. If the surfaces of downhole equipment (drill stems, augers, bits, etc.) and sampling equipment are painted, badly rusted or coated with materials that are difficult to remove using the steam cleaning/wire brushing procedure, sandblasting will be employed. In addition, the downhole and other sampling equipment will be further decontaminated using the following procedure:

1. Clean with tap water and laboratory detergent, using a brush if necessary, to remove particulate matter and surface films. Steam cleaning will be required for particularly contaminated equipment.

2. Rinse thoroughly with tap water.

3. Rinse thoroughly with deionized water.

4. Rinse twice with pesticide grade isopropanol.

5. Rinse thoroughly with organic-free water and allow to air dry as long as possible.

6. Wrap with aluminum foil, if appropriate, to prevent contamination if equipment is going to be stored or transported.

2.15 RI WASTE MANAGEMENT

All potentially hazardous wastes generated during the RI will be placed in 55 gallon drums and stored on the ground in a fenced area near the field trailer. Wastes which may be handled in this way include:

- Disposable protective clothing
- Disposable sampling equipment
- Used sample containers from the split spoon sample screening
- Isopropanol

These wastes will be disposed of at a permitted hazardous waste management facility following completion of the RI. Manifesting of wastes generated during the RI will be the responsibility of the PRP's.

Drill cuttings and well purge and development water will be buried in shallow pit(s) near the well or boring location and will not be handled as described above, except for wells and soil borings drilled offsite, in which case the cuttings, drilling fluids, and well development water will be contained and then disposed of at selected onsite locations. These disposal sites will coincide with existing onsite pits. No wastes generated from onsite activities will be allowed to leave the site.

2.16 QUALITY ASSURANCE PROCEDURES

Duplicate Analyses

A number of the samples submitted to the laboratory will be collected and analyzed in replicate (duplicate). Samples for duplicate analyses will be selected at random by the Field Operations Leader, and so designated at the time they are logged in and the parameters for duplicate analyses are selected. Samples for duplicate analysis will be designated by field personnel at the time of sample collection. Duplicate analyses will be performed for a minimum of one sample for each matrix or for 10 percent of the total samples for each matrix, whichever is greater. Duplicate sample procedures will be applied to both the subcontracted laboratory and the CLP laboratories. This provides a check of sampling equipment and technique for precision.

Standard Quality Assurance Samples

A standard quality assurance sample (spiked sample) is a known amount of an analyte in a consistent matrix prepared by an outside organization. This spiked sample provides information on the accuracy of the analytical method, but it will not give any information on matrix effects or natural background levels of the analyte. Spiked samples will be submitted for analyses for each week that environmental samples are submitted for analyses. All spiked samples will be provided by EPA, ESD, Athens, Georgia.

Trip Blanks

Trip blanks are defined as sample of contaminant free water, already in sample containers that are carried out to the site, stored with any investigative samples collected, and shipped together to the laboratory. Trip blanks will be submitted to the laboratory for analysis at the rate of one trip blank per week of sampling. The true identity of the trip blank samples will be unknown to the laboratory. These samples will be provided by EPA, ESD, Athens, Georgia.

Split Sample

Samples split between several laboratories will be logged in and identified as such. They will be analyzed along with regular samples. Samples split between the subcontracted laboratory and a CLP laboratory will provide check of the analytical procedures of the subcontracted laboratory.

3.0 FIELD INVESTIGATION PROCEDURES

3.1 PROPERTY RECONNAISSANCE

The property reconnaissance will consist of a field inspection of the entire Bluff Road Site. The area will be inspected for signs of disposal (in locations outside known disposal areas) or signs of contaminant migration. Areas of concern may include exposed drums, leachate seeps, disturbed soil, discolored soil, or stressed vegetation. Inspection techniques will include visual observation and the use of a HNu photoionization detector to scan specific areas. Areas of concern will be located on the available maps of the property and marked in the field. Once the topographic maps are completed, the locations of any areas of concern will be added.

3.2 AIR QUALITY MONITORING

3.2.1 Number and Locations of Monitoring Locations

To prevent exposure to contaminants during each operation, air quality will be monitored at each surface soil sampling station before and after each sample is collected. Air quality will also be monitored before and during all subsurface sampling activities and during groundwater sample collection. In addition to air quality monitoring at specific sampling locations, the air quality at the site will be monitored periodically on a daily basis to identify the presence of any hazardous conditions.

3.2.2 Procedures for Air Quality Monitoring

Before and during surface soil, subsurface soil, well installation and sampling, air quality will be monitored with an HNu photoionization meter and/or a OVA organic vapor analyzer. Daily monitoring of the Bluff Road site will also be conducted for air quality determination. All instrument readings will be noted in the field log books.

3.3 PRIVATE WELL INVENTORY

3.3.1 Number and Location for Well Inventory

Approximately 25 private residences southeast of the site along State Route 37 will be contacted to determine if a well is located on the property. Figure 3-3 shows the locations of private residences along State Route 37.

3.3.2 Procedures for Well Inventory

To identify potential receptors downgradient from the site, private residents will be contacted to determine if a well(s) is located on the property and to identify its use, depth, method of installation, and well construction materials used, if known. All information obtained will be recorded in the field log books.

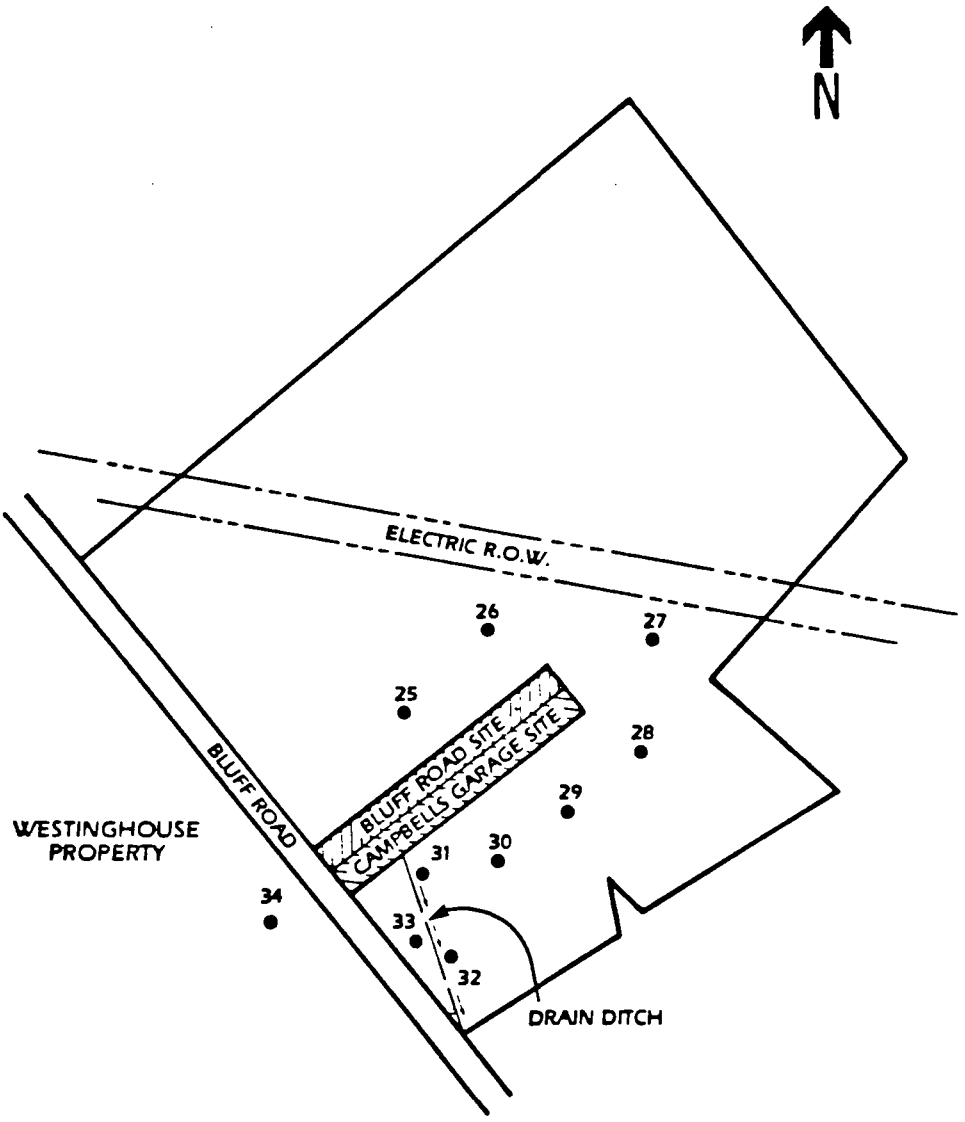
3.4 SURFACE SOIL SCREENING

3.4.1 Number and Locations of Samples

Thirty-four soil samples will be collected and analyzed to screen out and/or identify contaminated areas. The location of these samples are designed to screen the relatively large open areas of the site. In addition, upgradient background samples will be collected and downgradient samples will be collected for detection of contaminate migration. Figures 3-1 and 3-2 show the approximate locations of surface soil samples.

3.4.2 Procedures for Soil Sampling and Analysis

Procedures for soil sampling conform to those described in EPA Region IV Standard Operating Procedures and Quality Assurance Manual (SOP), Section 4.9. Each sample location will initially be screened with an HNu photoionization



NOT TO SCALE

REM III

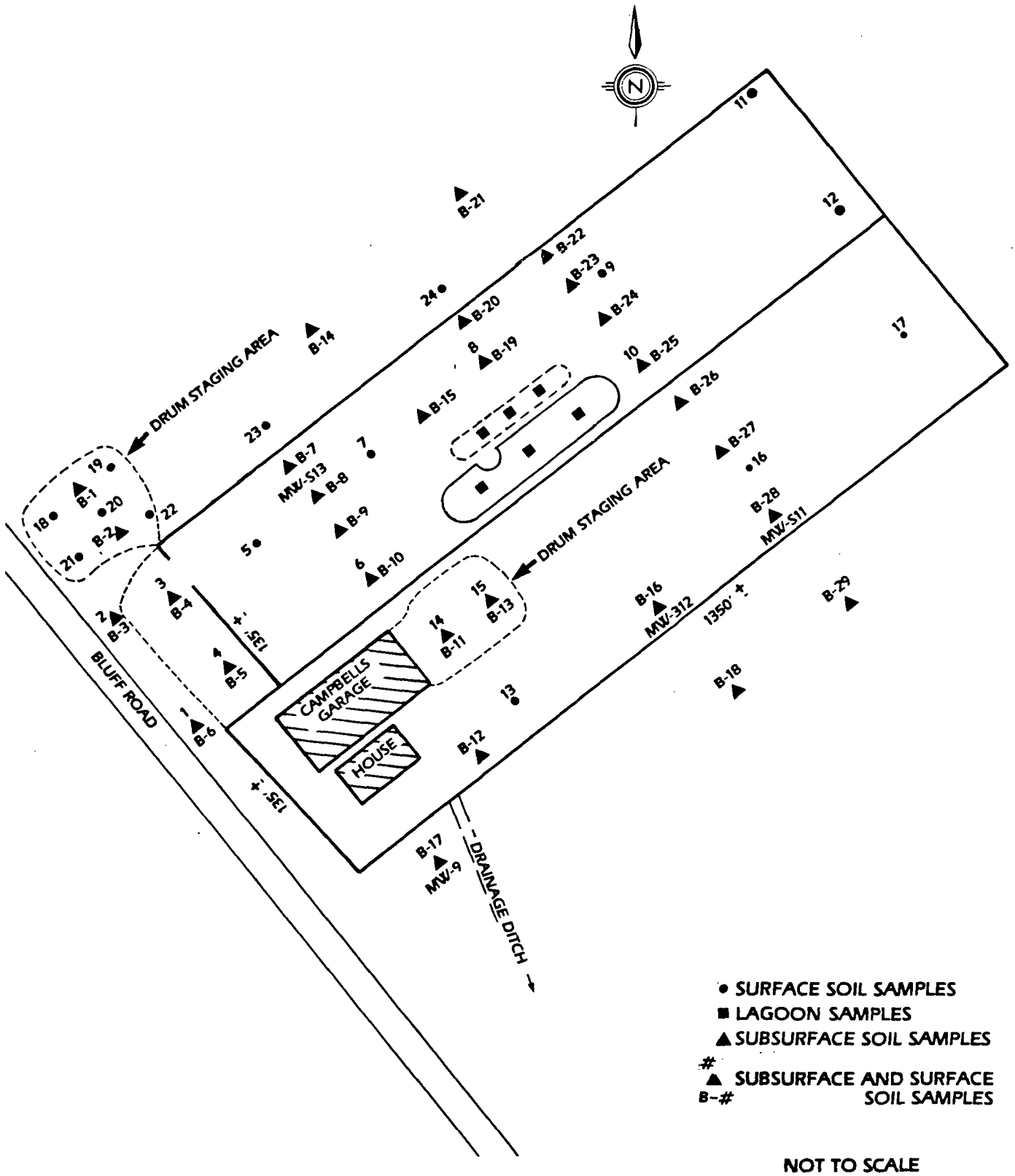
OFF SITE SURFACE SOIL SAMPLES

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE

3-1



REM III

SITE SAMPLING

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE 3-2

meter or an organic vapor analyzer before sample collection begins. Approximately 34 samples will be collected from the surface to a depth of six inches. All soil samples will be collected using a stainless steel hand auger or scoop. Each sample will be screened using the HNu or an organic vapor analyzer and the values will be recorded in the Field Sampling Log Book.

Soil samples will be analyzed by a local laboratory for quick turnaround analyses. These preliminary data will be used for guidance in planning other sampling tasks and the RI report preparation.

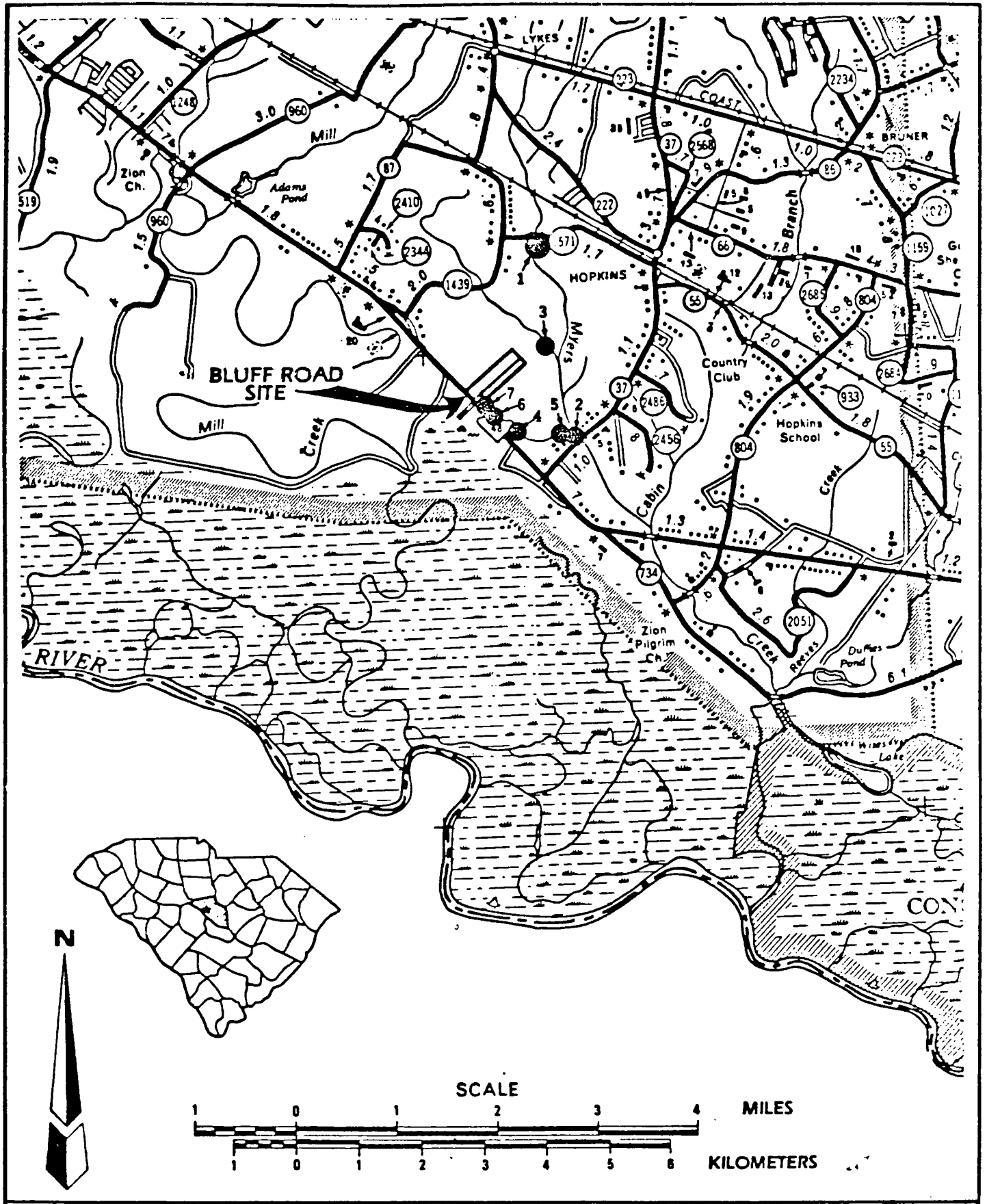
3.5 SURFACE WATER AND SEDIMENT SAMPLING

3.5.1 Number and Location of Surface Water Samples

Seven surface water samples will be collected during the Bluff Road RI. Sampling will be performed at the following locations, if water is available in these water bodies (Figure 3-3):

- Myers Creek upstream of the confluence with the unnamed tributary to the north of the site.
- Myers Creek downstream of the confluence with the unnamed tributary to the southeast of the site.
- The unnamed tributary just upstream of its confluence with Myers Creek.
- The intermittent stream just upstream of the confluence with Myers Creek.
- The intermittent stream just downstream of its confluence with the drainage ditch.
- The drainage ditch to the southeast of the site, just upstream of its confluence with the unnamed tributary.
- The drainage ditch just downstream of Bluff Road Site.

Surface water samples will be analyzed by a CLP laboratory for TCL analysis.



REM III

SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE 3-3

3.5.2 Procedures for Surface Water Sampling and Analysis

Samples will be collected from these stations directly into the sample bottle whenever possible. VOC samples should be collected first. If the water is too shallow to allow larger sample bottles to be immersed for direct collection, a hole will be dug with a properly cleaned scoop or shovel to allow for room to immerse the sample bottle. Collect a sediment sample and allow the sediment to settle before collecting the water sample. The sample bottle should be held with the opening pointing upstream. The person collecting the sample will stand downstream of the bottle.

3.5.3 Number and Location of Sediment Samples

To provide an indication of long-term contaminant release from the site, surface stream sediments will be collected from the following stations:

- At each of the surface water sampling locations (Figure 3-3).
- From any surface run-off areas at the site proper.

3.5.4 Procedures for Sediment Sampling and Analysis

Except for VOCs, samples from each of the points will be placed in a glass bowl (Pyrex), homogenized by mixing with a stainless steel spoon, and containerized (VOC samples should be gently mixed).

Samples will be collected with either an Ekman Dredge or a stainless steel scoop, depending upon the physical conditions at each location. The criterion for use of the Ekman Dredge is as follows:

- Ekman Dredge equipped with six-foot rigid extension and triggering device - appropriate for shallow streams with significant unconsolidated sediment.

Sediment samples will be analyzed by a CLP laboratory for TCL analyses.

3.6 GROUNDWATER SCREENING

3.6.1 Number and Locations of Groundwater Samples

Samples of groundwater will be collected initially for chemical analysis from 25 existing monitor wells (Figure 3-4).

3.6.2 Procedures for Groundwater Screening and Analysis

Groundwater screening samples will be analyzed by a local laboratory for quick turnaround analysis. All samples will be analyzed for metals and VOCs.

3.6.2.1 Volatile Organic Compounds

Samples for determination of volatile organic compounds (VOCs) will be removed first from the well after purging. Care will be taken to minimize agitation/aeration of the samples at all stages of removal and containerization. Three replicate samples will be taken at each well with a Teflon bailer. Samples for VOCs will be taken as soon as sufficient water volume is available in the well after appropriate purging, and preserved as required in Table 2-2. All samples collected will be placed in a cooler containing ice as soon as possible after samples are obtained.

3.6.2.2 Organic Analyses

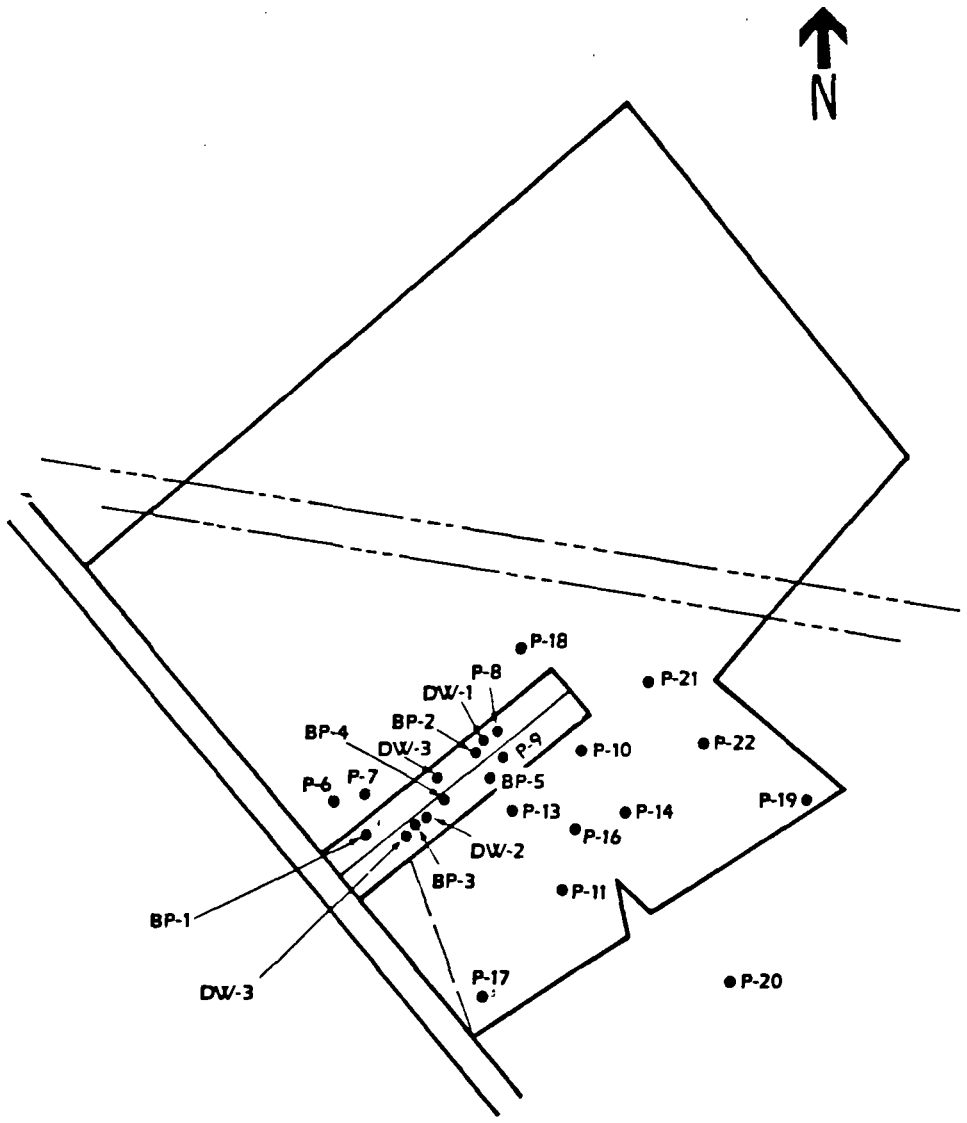
Samples for determination of organic compounds will be collected and preserved as provided in Section 4 of the ESD SOP's.

3.6.2.3 Inorganics Analyses

Samples for determination of metals will be collected and preserved as provided in Section 4 of the ESD SOPs.

3.6.2.4 Field Measurements

A separate sample will be collected for the field measurement of pH, specific conductance, and temperature before samples are collected at each sample location. The first water removed from the well will be discharged carefully into a clean glass beaker. Appropriate



NOT TO SCALE

REM III
EXHISTING MONITER WELL LOCATIONS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
3-4

instruments will then be used to measure pH, temperature, and specific conductance. Also, measurements will be made immediately after the sample is removed from the well, temperature first to ensure that conditions did not change during sampling. All probes will be rinsed with deionized water and wiped clean with laboratory tissue after use at each well and decontaminated before removal from the site. Instruments will be calibrated and maintained according to manufacturer's recommendations. The pH meter will be calibrated prior to each sampling event with three buffer solutions. Calibration and maintenance events will be recorded in a field log book.

3.7 LAGOON SURFACE WATER AND SEDIMENT SAMPLES

3.7.1 Number and Location of Lagoon Samples

Three surface water and three sediment samples will be collected at the approximate middle of the onsite lagoon. The exact location for sample collection will be determined in the field. The water samples will be collected first with the sediment samples obtained from the same location.

3.7.2 Procedures for Lagoon Sampling and Analysis

All samples will be collected in accordance with the procedures discussed in Section 4.6 of the ESD SOPs. Surface water samples will be collected by dipping the container directly into the lagoon if possible. If the lagoon has inadequate depth to permit the use of this method, a stainless steel or glass beaker will be used to transfer the sample into the container. Sediment samples will be collected using a stainless steel scoop. These samples will be analyzed by a CLP laboratory for TCL compounds.

3.8 LAGOON SOIL SAMPLING

3.8.1 Number and Location of Lagoon Soil Samples

Six sampling locations will be required for both lagoons to determine the hazardous nature of the material. Exact sampling locations will be determined in the field. Approximate lagoon soil sampling locations are shown in Figure 3-2.

3.8.2 Procedures for Soil Sampling and Analysis

Procedures for soil sampling conform to those described in Section 4.9 of the ESD SOPs. All soil samples will be collected using a stainless steel hand auger. As each sample is brought to the surface, it will be screened using the OVA. These samples will be analyzed by a CLP laboratory for TCL compounds.

3.9 TEMPORARY WELL SAMPLES

3.9.1 Number and Location of Temporary Wells

Sixteen temporary wells will be sampled for VOCs and metal analysis. Approximate locations for the temporary wells are shown in Figure 3-5.

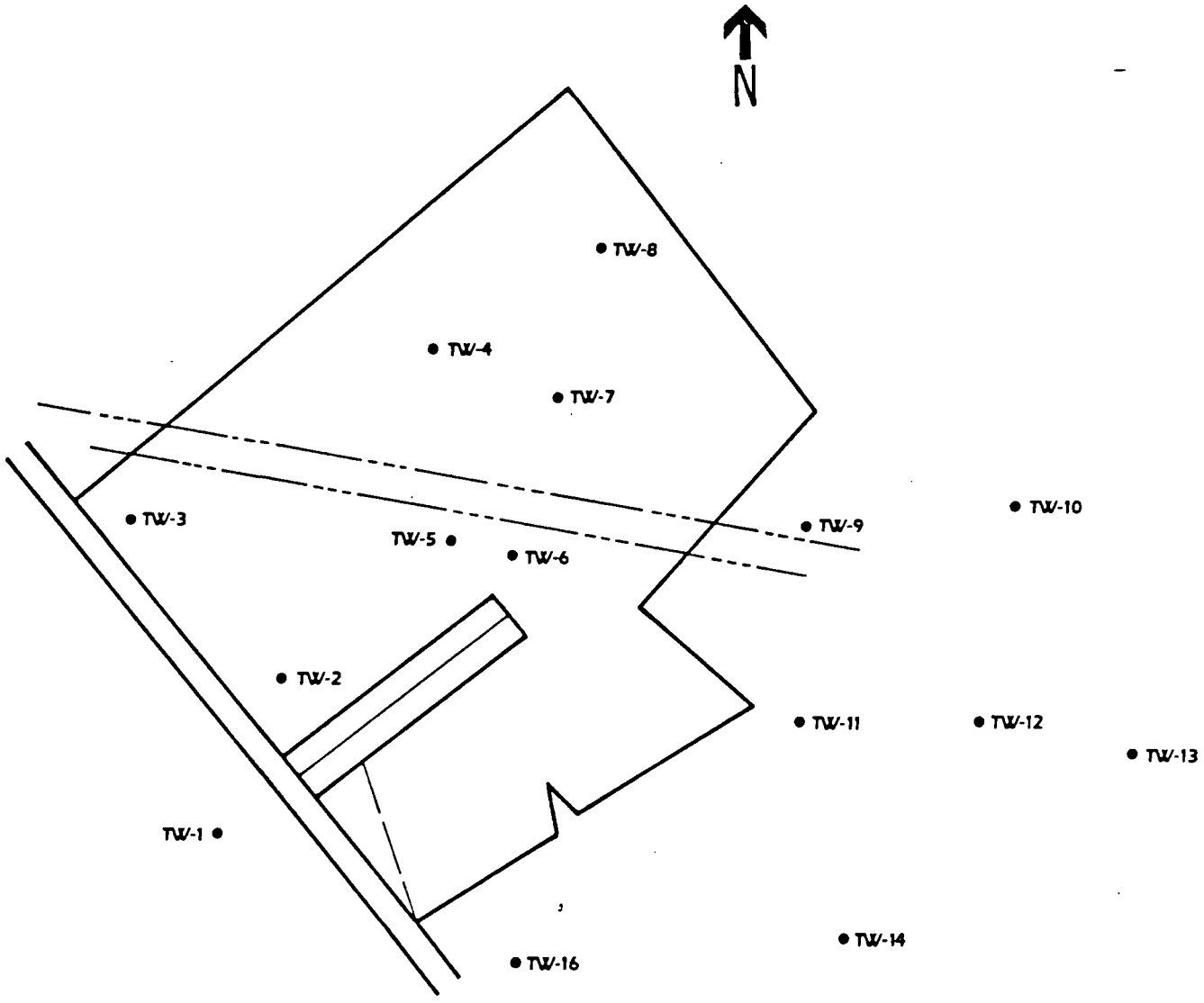
3.9.2 Procedures for Installing Temporary Wells

Approximately 16 temporary (10 to 15 feet deep) boreholes will be drilled with a four-inch stainless steel hand auger. The borings will be terminated in the shallow surficial aquifer.

The monitor wells will be constructed of two-inch I.D., threaded flush joint, stainless steel casing with two-feet, 0.010-inch slot, wire wrapped, stainless steel screens containing a stainless steel bottom plug. The wells will have a 2.5 foot riser above ground surface. Following the collection of a representative groundwater sample, the well materials will be removed and decontaminated, and the borehole will be backfilled to the surface with cuttings.

3.9.3 Procedures for Developing Temporary Wells

All wells will be developed following installation by pumping the formation water out until the water is free of sediment and pH, conductivity, and temperature stabilizes. For temporary well sampling the development process will also constitute a well purge. The development should eliminate most of the fine material from the area of the well screen and allow for the collection of a representative groundwater sample which is relatively free of suspended materials. A peristaltic pump will be used to develop the temporary wells.



NOT TO SCALE

REM III
TEMPORARY WELL LOCATIONS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
3-5

3.9.4 Procedures for Sampling Temporary Wells

After the temporary well is developed to a point where a relatively clear sample can be collected and the pH, conductivity, and temperature stabilizes the well will be sampled according to the procedures outlined in Section 4.7.5 of the ESD SOP's.

The Teflon tubing and silicone tubing will be replaced before each well is developed. All temporary well samples will be analyzed for VOCs, metals, and cyanide by a local laboratory.

3.10 SOIL BORINGS

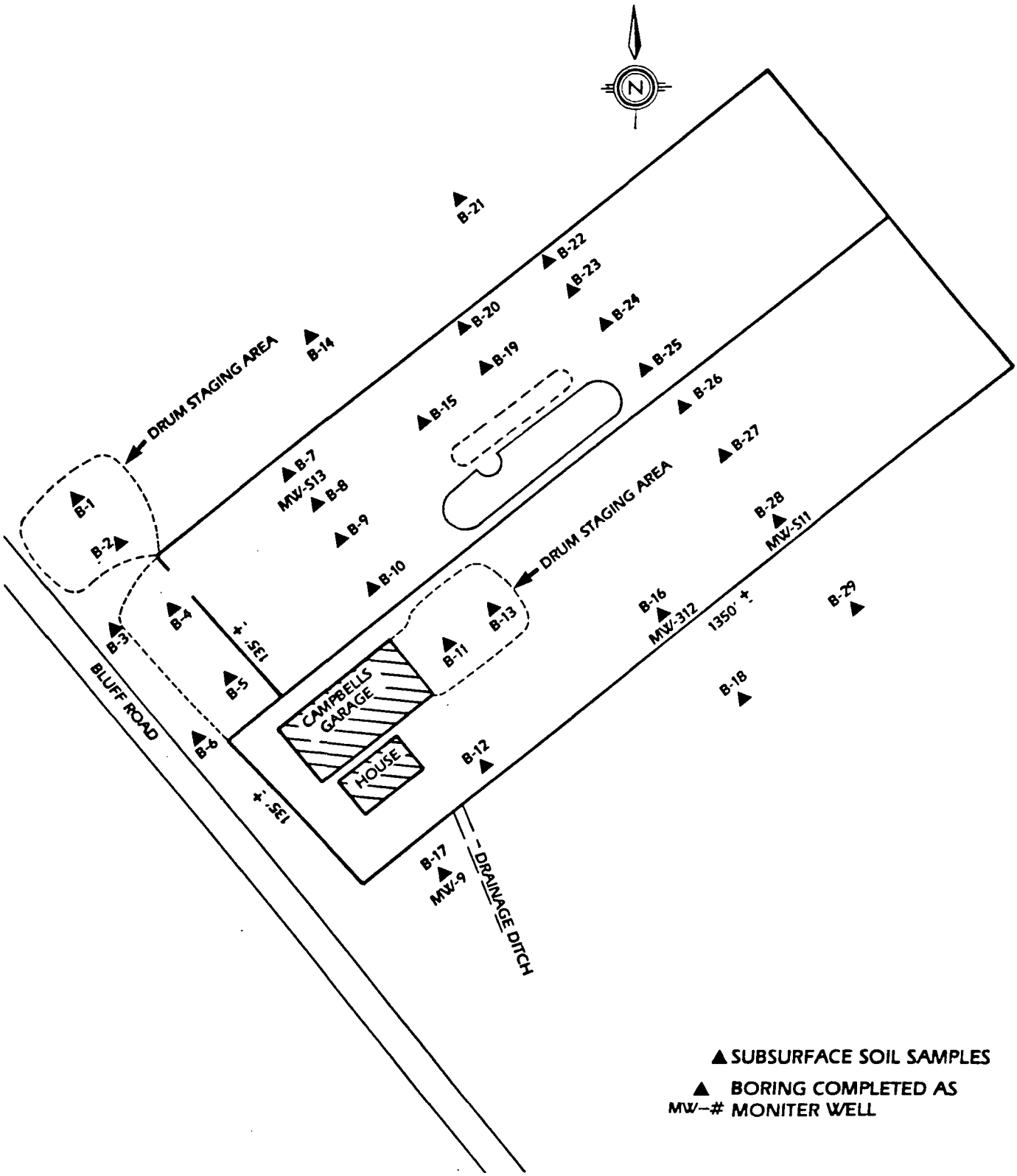
3.10.1 Number and Location of Soil Borings

Twenty-nine soil borings will be completed within and near the study area at the Bluff Road Site. Preliminary locations for these borings are shown on Figure 3-6. Exact locations will be determined in the field and will be based on information generated from the site screening investigation. These borings will be completed to identify contaminant concentrations and the general subsurface conditions. Samples will be collected in selected areas of the site as follows:

- Soil borings on-site for chemical analysis.
- Soil borings immediately downgradient of the site for chemical analysis.
- Soil borings immediately upgradient of the site for chemical analysis.

The borings will be advanced to the top of the surficial aquifer and split spoon samples will be collected every five feet, starting at a depth of 5 feet, for lithologic information and sample analysis. The borings are expected to range from 10 to 20 feet in depth.

Each split spoon sample will be geologically logged and screened for organic vapors using the HNu. All samples will be analyzed by a CLP laboratory for TCL compounds. It is anticipated that approximately 87 samples will be analyzed.



REM III

SUBSURFACE BORING LOCATION MAP

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE 3-6

3.10.2 Drilling Procedures

It is anticipated that all soil borings will be completed using the hollow stem auger method. If at a potential soil boring or monitor well location, the hole cannot be completed using a hollow stem auger, the mud rotary method will be used to produce a hole at least six inches in diameter.

Hollow stem auger and mud rotary drilling (if necessary) will be performed according to the procedures outlined in ESD SOP's and the boreholes will be logged by a geologist according to ESD SOP's. A six-inch O.D. hollow stem auger will be used. Split spoon samples will be collected and logged for lithology. The split spoon will be capable of collecting a 24-inch sample. Should mud rotary drilling be necessary, a sample of the bentonite drilling mud will be collected and sent to a CLP and/or REM III laboratory for TCL analyses. The source of water for mud rotary drilling will be a local municipal system. This water will also be sampled and sent for the above described analyses. All proposed procedures are in compliance with the drilling, logging, and split spoon sampling methods discussed in Section 4.7.3.2, 4.7.9.3, and 4.9.4.4 of the ESD SOPs.

Upon completion of sampling, all boreholes that will not be completed as monitor wells will be abandoned by grouting. Grouting will be accomplished by the Tremie pipe method. Grouting will conform to ASTM standard method for neat cement grout C150-69A.

3.10.3 Sampling and Analysis

When the split spoon sampler is retrieved from the borehole, it will be opened and the sample placed in containers according to the procedures described in Sections 4.9.4 through 4.9.6 of the ESD SOPs. Samples from selected depths will be prepared for shipment to a CLP laboratory for TCL analyses. All samples will be placed on ice as soon as possible after collection.

Selected samples will also be sent for laboratory determination of moisture content, grain size distribution, and Atterberg limits. One sample from each soil type encountered during boring operations will be sent for these analyses. An estimated 15 samples will be tested for these

parameters. Also, four Shelby tube samples will be collected and sent for laboratory determination of permeability. The following methods will be used to determine the above mentioned parameters:

- Moisture content - ASTM D2216-71
- Grain size distribution - ASTM D422-63
- Atterberg Limits - ASTM D423-66 and ASTM D424-59
- Permeability - ASTM D2434-68 or U.S. Corps of Engineers EM-1110-2-1906

Collection of Shelby tube samples will preclude the collection of split spoon samples for chemical analysis. The drilling subcontractor will be responsible for these physical analyses.

3.11 GROUNDWATER INVESTIGATIONS

Approximately 17 shallow monitor wells and four deep monitor wells will be installed at the Bluff Road Site. Six of these wells will be installed to evaluate downgradient water quality and the extent of the groundwater contamination plume. Figure 3-7 shows the preliminary well locations. The exact locations of the wells will be determined in the field and will be based on the results of earlier tasks of the investigation and site conditions. Slug tests will be performed at approximately 12 wells following development and sampling.

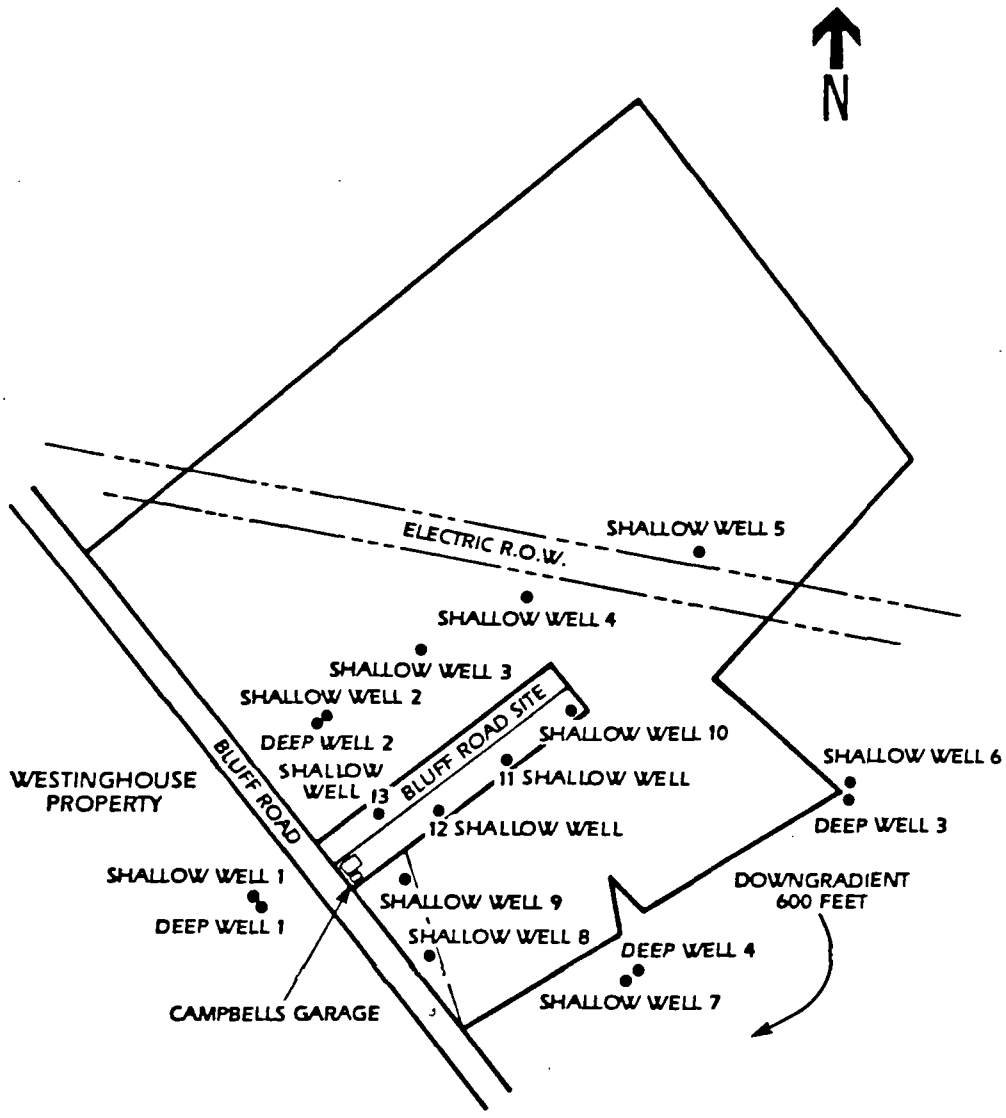
3.11.1 Shallow Monitor Well Installation

Monitor well installation will be performed in accordance with Sections 4.7.1 to 4.7.3 of the ESD SOPs. Boreholes will be advanced until the proper depth is reached. Monitor wells will then be constructed of flush threaded, two-inch nominal diameter, type 316 stainless steel riser pipe and well screen. Figure 3-8 illustrates typical well construction details.

Since some monitor wells may be installed at relatively shallow depths at some locations (less than ten feet), screen lengths may vary. The well driller will be required to have two-, five-, and ten-foot lengths of well screen available in the field. The Site Geologist will select the screen length based on monitor well depth and the likelihood of wide variations of water level. Ten-foot screens will be used in all deep well construction. Five-foot screens will generally be used in shallow well construction. Shorter screens (two-foot) will be used when, in the opinion of the Site Geologist, the use of a ten-foot screen would compromise the structural integrity or reliability of the well. Well screens will be of the wire-wrapped type and have a slot size of 0.01 inch.

Well installation will involve installing the riser and screen into the open borehole. The screen will then be surrounded with a sand pack consisting of 20/40 mesh silica sand placed by tremie pipe to a minimum depth of two feet above the screen. Stainless steel centralizers will be used if necessary at the bottom and top of the screen to keep the screen centered in the hole while sand is added. A minimum two-foot seal of bentonite pellets will be placed by tremie pipe above the sand pack. The bentonite pellets will be allowed to hydrate for the period designated by the manufacturer, prior to placing the grout. The remaining annulus will be grouted from the top of the bentonite seal to approximately three feet below the ground surface with a bentonite cement grout mixture, by tremie pipe as per ASTM standard method for neat cement grout C150-69A. The grout will be allowed to set for at least 24 hours before additional grout is added to the annulus to compensate for settling. The exact depths of all backfill materials will be determined in the field by the Site Geologist, based on the depth of the well and observed subsurface conditions at each boring location. Backfill depths will be monitored by the driller by means of a weighted steel tape.

A five-foot long, four-inch diameter, steel, protective casing with a locking lid will be placed over the riser to extend about three inches above the riser. The protective casings will be painted fluorescent orange with weather-resistant rust-proof spray paint prior to installation and grout will be added to the inside of the protective casing to a level approximately six inches above ground surface. A stainless steel cap will be placed on



NOT TO SCALE

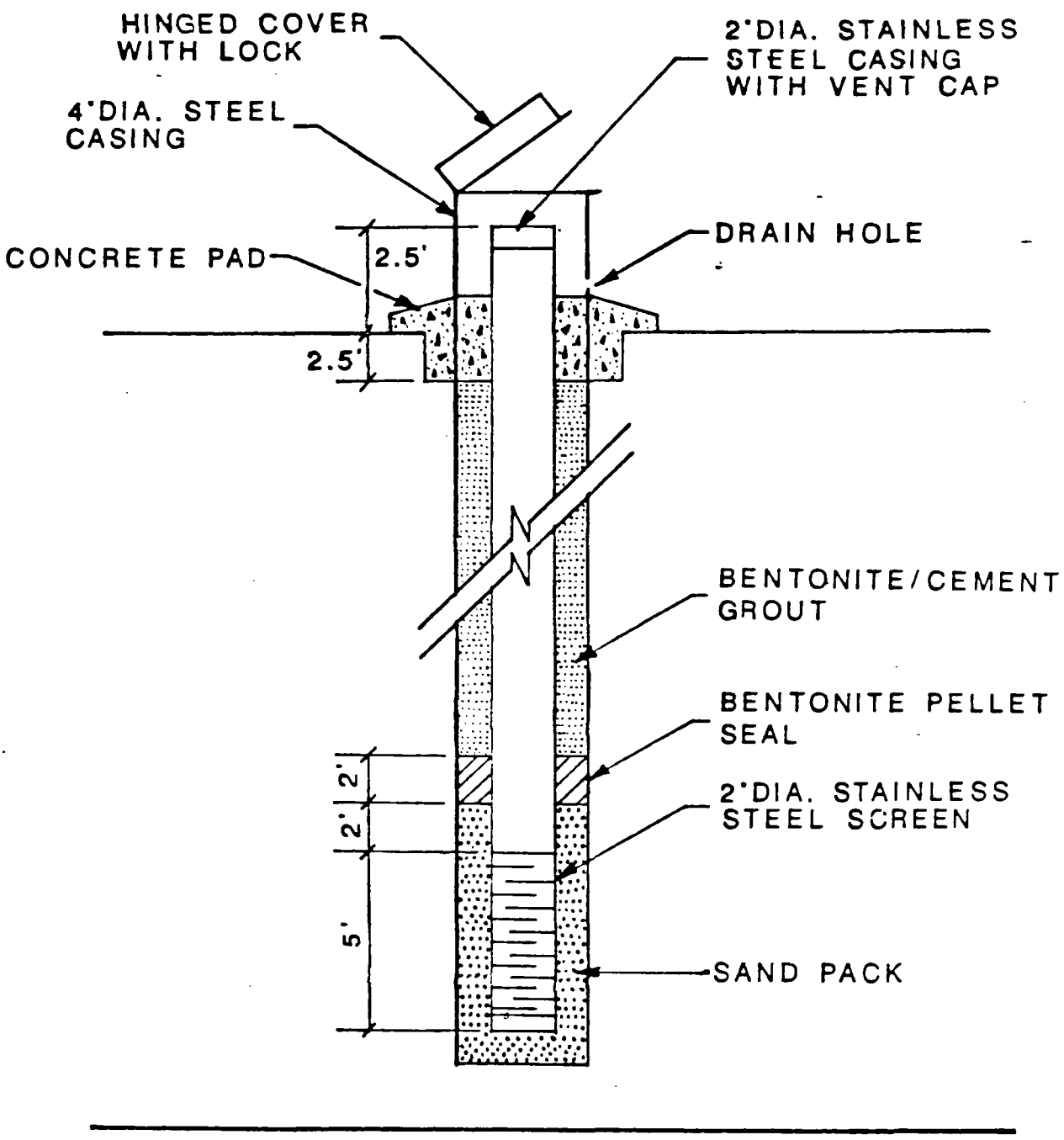
REM III

MONITER WELL LOCATION MAP

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE 3-7



REM III

SHALLOW MONITER WELL CONSTRUCTION

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE 3-8

the riser pipe. The cap will have a 1/8 inch hole to allow water levels to equilibriate to atmospheric pressure. A 1/4 inch hole will also be drilled in the protective casing at a point just above the inner grout seal.

A four-foot square concrete pad will be constructed around each well (after the grout has set) according to the following specifications:

- The area around the casing will be excavated to below the frost line, approximately 18 inches.
- A four-foot by four-foot form constructed of two-inch by six-inch lumber will be placed around the casing.
- The form will set a minimum of one inch below the ground surface and a minimum of four inches above the ground surface.
- The form will be filled with concrete.
- Before the concrete sets, it will be sloped from the casing down to the outer edge to facilitate drainage.
- After the concrete sets, the forms will be removed.
- A nail or other permanent mark will be set in the concrete pad for surveyed reference.

3.11.2 Deep Monitor Well Installation

Four deep monitor wells approximately 100 to 130 feet in depth will be installed. These wells will initially be advanced with a 14-inch diameter bit or auger to the top of the Black Mingo clay. A Shelby tube sample will be collected from the clay at each location. A 12-inch diameter PVC casing will then be installed approximately two feet into the clay and grouted to the surface. After allowing the grout to set for 48 hours, drilling will continue until the deeper groundwater aquifer is penetrated. The boring will then be completed as a permanent monitor well using 2-inch I.D. threaded flush joint, stainless steel casing with a 10-foot, 0.010-inch slot, wire-wrapped, stainless steel screen. The well will

be completed with a 2.5-foot riser above ground surface. The deep monitor wells will be completed and secured in the same manner as shallow monitor wells, 3.9.1 (see Section 3.10.1). Figure 3-9 shows method for deep well construction.

3.11.3 Well Development

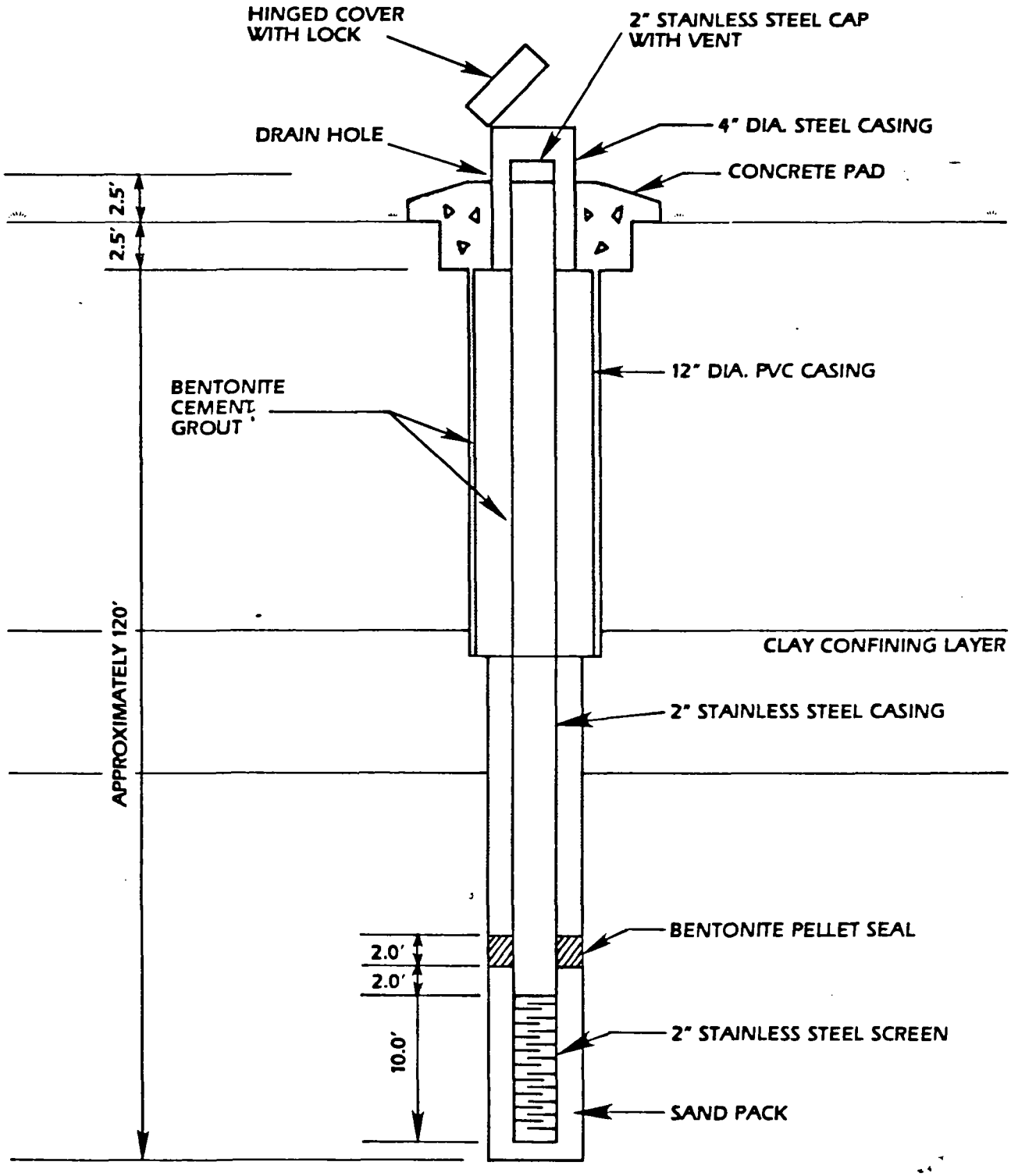
All wells will be developed following installation by overpumping, or using a surge block. Sediment-laden water will be removed as frequently as possible. The frequency and quantity of water removed will be based on the yield of the well. All well development procedures will be in accordance with Section 4.7.4 of the ESD SOPs.

3.11.4 Monitor Well Sampling

Monitor wells will be purged and sampled according to the procedures outlined in Section 4.7.5 of the ESD SOPs. Water level in the well will first be measured and the total volume of the water column calculated. A minimum of three times the volume of water in the well will then be purged or the well will be pumped until dry. Conductivity, pH, and temperature will be periodically measured and recorded during purging. If stabilization of these parameters occurs during purging, purging will be discontinued. A peristaltic or bladder pump and dedicated teflon tubing will be used to purge the wells.

- After purging is complete, the total metals sample will be collected directly from the pump discharge.
- The teflon tubing will be removed from the well.
- The remaining sample fractions will then be collected using a teflon or stainless steel bailer and dedicated nylon cord.

The teflon tubing, silicone tubing, and filter will be replaced before each well is sampled. The same tubing will be used to purge and sample the well.



REM III

DEEP MONITOR WELL CONSTRUCTION

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE No.

3-9

3.11.5 Slug Testing

Following development and sampling of all new wells, approximately 12 wells will be tested to evaluate the hydraulic conductivity of the aquifer in the area of the well. Slug tests will be accomplished using the following procedures:

- A pressure transducer will be lowered approximately 5 feet into the water and connected to a data logger. This equipment will be of the type manufactured by In-situ, Inc.
- The data logger and pressure transducer will be activated. A stainless steel or teflon® slug will then be lowered into the well to displace a volume of water.
- Once the water level has stabilized, the slug will be quickly removed from the water.

3.11.6 Water Level Measurement

Water level measurements will be collected periodically during the RI investigation. The different events will be:

- Initial status water levels from existing wells
- Before groundwater sampling
- Before aquifer testing
- Final round of water levels will be collected from existing wells and new monitor wells.

During the first and last measurement task, the team performing the measurements will move directly from well to well until water levels are measured in all wells. All water level measurement procedures will be in compliance with Section 7.7.2.4 and 7.7.5 of the ESD SOPs.

- The water level will be automatically monitored by a transducer during the falling head tests.

Data generated by these tests will be printed out at the completion of each test. The data will then be entered into a personal computer and evaluated. The data generated from water level measurements will aid in better defining groundwater flow directions and to determine the impact of precipitation events on the aquifer.

3.12 ABANDONMENT OF EXISTING MONITOR WELLS

Eleven shallow (9-22 feet) PVC monitor wells will be abandoned. These wells were installed by SCDHEC in January 1981. The well installation techniques used are questionable by EPA procedures. The well screen and casing will be removed from each well where feasible and the remaining open borehole will be grouted to the surface, by tremie pipe as per ASTM standard method for neat cement grout C150-69A. The grout will be allowed to set for at least 24 hours before additional grout is added to compensate for settling..

3.13 MONITOR WELL SURVEY

A subcontracted licensed surveyor shall be responsible for providing both horizontal and vertical locations for 21 new monitor wells installed by the PRP's contractor, and locations of all abandoned boring locations.

A permanent reference marker (nailhead, etc.) will be placed in the concrete pad at the base of each well. Subsequent location descriptions will reference to this marker. Additionally, horizontal and vertical measurements will be made at the top of each well casing with the cap removed.

3.14 SITE SURVEY

This task will occur concurrently with monitor well surveying. The surveyor will define the site area and provide a base map at a scale of one inch equals 200 feet with all wells and borings located.

3.15 AQUATIC BIOTA SURVEY

The aquatic biota survey will determine the abundance and diversity of fish and benthic macroinvertebrates in the streams at the surface water sampling stations in the

vicinity of the site. The survey will be performed during the remedial investigation. Flow conditions will be measured during the sampling event. For all organisms observed, it will be determined if they are tolerant or intolerant species.

Fish specimens will also be collected in the streams where possible at the surface water sampling stations as described in Section 3.4.1 (except the drainage ditch stations). A field judgement as to the actual number of sampling locations will be made based on U.S. EPA/SCDHEC approval. The number of stations to be sampled may be reduced by U.S. EPA/SCDHEC due to impossible working conditions. Specimens will be collected over a 24-hour period, identified, counted, and released if still alive. Any specimens not alive at the end of the sampling period will be properly disposed of after identification and counting.

Benthic macroinvertebrate organisms will be collected where possible at the surface water sampling stations as described in Section 3.4.1 except for the drainage ditch stations. Organisms collected will be identified to a general level to determine diversity index, tolerance categorization, and counted to determine abundance. All sampling and analyses will conform to U.S. EPA "Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents" EPA-670/4-73-001 July 1973.

The RI Investigation will also inventory the fish and benthic macroinvertebrates and determine in-situ measurements of pH, temperature, and conductivity at the surface water sampling locations.

APPENDIX A

SPECIFICATIONS FOR LEVEL III LABORATORY ANALYSIS SAMPLE IDENTIFICATION AND CHAIN OF CUSTODY

SPECIFICATIONS FOR LEVEL III LABORATORY ANALYSES

Level III analytical data is analyses for which there is a high degree of confidence in the compound identification and quantification. The degree of confidence is not as high as Level IV (Contract Laboratory Program) data. The distinction between the two is that with Level III less frequent QC samples are analyzed, more variation is allowed, and the data validation is not as strict. The emphases of Level III data is to support treatability studies, engineering design, engineering action and in some cases, risk assessment.

The QC parameters that are to be used in producing Level III data are found in Table B-1. Additional guidance is found in the Region IV ESD SOPs.

The deliverables for a Level III analysis including a data summary are as follows:

A. General Reporting Requirements

1. Chain-of-Custody Form

2. Laboratory Chronicle which includes:

   - date sample received
   - date sample extracted or prepared (if applicable)
   - date sample analyzed

3. Brief Method Summary

   - if strict adherence to a referenced EPA approval method was followed, only a listing of the method and reference is required.
   - if a non-EPA referenced method (i.e. industrial assay method, etc.) or any deviation from a referenced EPA approved method is followed (i.e. reduction in sample extraction or injection volume, etc.) a method summary or any deviation from the EPA approved method must be provided.

B. Requirements of Organics by GC/MS:

1. Tune summary with signature certification.

2. QA/QC results which include:

   - Duplicate analysis (preferably on a mid-range concentration sample) at a frequency of 1 per 20 samples analyzed.

   - Matrix spike analysis (preferably on a sample containing some contaminants) at a frequency of 1 per 20 samples analyzed. The compounds to be spiked in each analytical fraction are those listed in the most recent CLP IFB SOW.

   - Surrogate compound recovery summary - utilizing the compounds listed in the most recent version of EPA methods 624/625, 1624,/1625, SW-846 or EPA CLP IFB SOW.

3. Sample, blank and standard reconstructed ion chromatogram (RIC).

4. If a library search is performed, the results of the library search (including the ion current profiles) must be provided.

C. Requirements for Organic Analysis (GC/FID/ECD/PID/NPD/ ECD/TCD; HPLC: etc.)

1. Sample, blank and standard(s) chromatograms

2. At least one internal standard and/or surrogate compound must be utilized in all analyses. If the method used indicates specific compounds for this purpose, all of these compounds must be utilized.

3. QA/QC results which include:

   - Duplicate analysis (preferably on a mid-range concentration sample) at a frequency of 1 per 20 samples analyzed.

- Matrix spike analysis (preferably on a sample containing some contaminants) at a frequency of 1 per 20 samples analyzed for the analyte in question.

D. Requirements for Pesticides/PCBs (GC/ECD):

1. Sample, blank and standard(s) chromatograms.

2. Dibutylchlorendate must be used as a surrogate

3. QA/QC results which include:

- Duplicate analysis (preferably on a mid-range concentration sample) at a frequency of 1 per 20 samples analyzed.

- Matrix spike analysis (preferably on a sample containing some contaminants) at a frequency of 1 per 20 samples analyzed. At least one Arochlor and three pesticides are to be spiked for PCB and pesticide analysis, respectively.

E. Requirements for Inorganic Analyses (metals):

1. QA/QC results which include:

- Duplicate analysis (preferably on a mid-range concentration sample) at a frequency of 1 per 20 samples analyzed.

- Matrix spike (preferably on a sample containing some contaminants) at a frequency of 1 per 20 samples analyzed

F. Requirements for Inorganic Analyses (non-metals):

2. QA/QC results which include:

- Duplicate analysis (preferably on a mid-range concentration sample) at a frequency of 1 per 20 samples analyzed.
- Matrix spike (preferably on a sample containing some contaminants) at a frequency of 1 per 20 samples analyzed, if possible, for the analyte in question.

TABLE B-1
QC PARAMETER REQUIREMENTS

QA/QC LEVEL

Category	II	III	IV
Holding Time	Region IV ESD SOP Attachment A	Region IV ESD SOP Attachment A	Region IV ESD SOP Attachment A
Blanks	<DL	<DL	<DL
Freq. per samples	30	30	30
Organics:			
Initial Calibration			
Std. Curve	3 points	3 points	3 points
GC/MS			
RF	>0.05	>0.05	>0.05
RF deviation	<35%	<30%	<25%
RRT deviation	<1%	<1%	<1%
GC			
Peak Height/Max. Std. Hgt.	>20%	>20%	>20%
RT Deviation	<1.0%	<1.0%	<0.5%
Cal Factors deviation	<35%	<30%	<25%
Continuing Calibration Frequency			
Run Begin and End	yes	yes	yes
Samples per Std.	0	20	10
GC/MS/RF	>0.05%	>0.05%	>0.05%
RF Difference	<35%	<30%	<30%
RRT Difference	<1%	<1%	<1%
GC			
RT Variation	1.0%	1.0%	1.0%
Cal Factor	35%	30%	25%

GC/MS Tuning

DFTPP

m/z	compared to		%	%
51	198	22-75	22-75	30-6-
68	69	<2	<2	<2
70	69	<2	<2	<2
127	198	30-7	30-75	40-60
197	198	<1	<1	<1
198	198	100	100	100
199	198	5-9	5-9	5-9
275	198	7-37	7-37	10-30
365	198	>0.75	>0.75	>1.00
441	443	<0>(443)	<0>(443)	<0>(443)
442	198	>30	>30	>40
443	442	17-23	17-23	17-23

BFB

m/z	compared to		%	%
50	95	11-50	11-50	15-40
75	95	22-75	22-75	30-60
95	95	100	100	100
96	95	5-9	5-9	5-9
173	95	<1	<1	<1
174	95	>50	>50	>50
175	174	5-9	5-9	5-9
176	174	95-101	95-101	95-101
177	176	5-9	5-9	5-9

Surrogates No.	None	1	2
Recovery	None	see method	see method
Matrix Spikes Freq.	None	1 per 30	1 per 20
Recovery	N/A	40-130%	75-125%
Duplicates Freq.	None	1 per 30	1 per 20
Rel. % Dev.(RPD)			
Water	N/A	<35	<25
Soil	N/A	<50%	<40%

Compound Identification			
GC/MS			
RRT	0.06	0.06	0.06
m/z ions >10%	all present	all present	all present
% Difference intensity	<20%	<20%	<20%
Library searches	None	None	Yes
GC			
RT Difference	<1%	<1%	1%
2nd column ID	None	None	Yes
Inorganics:			
AAS Std. Curve	3 std's	3 std's	4 std's
ICP Std. Curve	3 std's	3 std's	3 std's
Continuing Calibration Frequency			
Begin Run	Yes	Yes	Yes
Samples per Std.	0	20	10
Control limits	80-120	85-115	90-100
Matrix Spikes			
Frequency	0	1 per 30	1 per 20
% Recovery	N/A	60-130	75-125
Surrogates No.	None	1	2
Duplicates			
Frequency	0	1 per 30	1 per 20
Soil RPD	N/A	40%	40%
Water RPD	N/a	25%	30%
Laboratory Control Sample	N/A	25%	30%
Freq. per samples	30	25	20
% Recovery	60-130	70-130	80-120
Atomic Absorption			
Duplicate injections per cent deviation	30	25	20
ICP			
Interference Check			
Samples per control	30	20	20
Control Limits	30%	25%	20%
Serial dilution			
Freq. per samples	30	25	20
Deviation	20	15	10

SAMPLE IDENTIFICATION AND CHAIN OF CUSTODY

EPA Region IV ESD SOPs specify the requirements for labeling and shipping samples.

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR REM III HAZARDOUS WASTE SITE ACTIVITIES

SITE: Bluff Road Site

LOCATION: Columbia, South Carolina

DATE PREPARED: January 5, 1988

PREPARED BY: Stephen L. Pilcher/Ebasco Services Inc.
(NAME/COMPANY)

PLANNED SITE ACTIVITY DATES: _____

REVISION: 0

EBASCO SERVICES INCORPORATED, EBASCO SUBCONTRACTORS AND THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE HAZARDOUS NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR USE BY EBASCO PERSONNEL AT THIS SITE AND SHOULD NOT BE USED BY ANY OTHER COMPANY OR INDIVIDUAL OR ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

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1.0 GENERAL

This plan provides recommendations concerning health and safety for those activities associated with the Remedial Investigation/Feasibility Studies at the Bluff Road Site and should be implemented by the Contractor's Health and Safety Officer (HSO) during site work. Compliance with this HASP is required of all persons and third parties who enter this site. The content of this HASP may change or undergo revision based upon additional information made available to health and safety (H&S) personnel, monitoring results or changes in the technical scope of work. Any changes proposed must be reviewed by H&S staff and are subject to approval of the Corporate Health and Safety Officer.

SITE Bluff Road Site SITE NO. _____

PLAN DATE April 1988

SCOPE OF WORK The operations at this site will include temporary borings for water sampling, well inventory, Health and Safety air monitoring, aquifer testing, soil borings/sampling (surface and subsurface), installation of monitoring wells for groundwater sampling, surface water runoff sampling, and an aquatic biota investigation.

	SITE MANAGER	HEALTH AND SAFETY OFFICER
NAME		
WORK PHONE		

EMERGENCY PHONE NUMBERS

Columbia, S.C.	Police Dept.	(803) 252-2911
Columbia, S.C.	Fire Dept.	(803) 252-2911
Columbia, S.C.	Rescue Service	(803) 252-2911
Baptist	Hospital	(803) 771-5050
Richland Memorial	Back-up Hospital	
National Response Center		(800) 424-8802
Richmond County Poison Control Center		(803) 765-7350

2.0 HEALTH AND SAFETY PERSONNEL

2.1 HEALTH AND SAFETY PERSONNEL DESIGNATIONS

The following briefly describes the health and safety designations and general responsibilities which may be employed for the Bluff Road Site.

2.2 REGIONAL HEALTH AND SAFETY SUPERVISOR (RHSS)

The RHSS has overall responsibility for development and implementation of this HASP. He also shall approve any changes to this plan due to modification of procedures or newly proposed site activities.

The RHSS will be responsible for the development of new company safety protocols and procedures necessary for field operations and will also be responsible for the resolution of any outstanding safety issues which arise during the conduct of site work. Health and safety-related duties and responsibilities will be assigned only to qualified individuals by the RHSS. Before personnel may work on site, currentness of acceptable medical examination and acceptability of health and safety training must be approved by the RHSS.

2.3 SITE HEALTH AND SAFETY OFFICER

The HSO will be present onsite during the conduct of all level A, or B, or high-hazard level C field operations and will be responsible for all health and safety activities and the delegation of duties to the H&S staff in the field. Where the site is identified as low-hazard level C or level D, the HSO may direct the site health and safety efforts through an assistant health and safety officer approved by the RHSS. The HSO or his assistant will be responsible for implementation of the HASP. He may direct or participate in downrange activities as appropriate when this does not interfere with his primary HSO responsibility. The HSO has stop-work authorization which he will execute upon his determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations, such as detrimental weather conditions. Authorization to proceed with work will be issued by the RHSS after such action. The HSO will initiate and execute all contact with support facilities and personnel when this action is appropriate.

2.4 ASSISTANT HEALTH AND SAFETY OFFICER

An Assistant HSO may be designated. On low-hazard level C or level D site he may have collateral duties but must be qualified for the health and safety responsibility by the RHSS. At level A, B or high-hazard level C sites, he will be the down range person who accompanies field sampling teams and will report to the HSO. Additionally, he may be required to support the HSO when multiple operations are conducted that require monitoring and HSO surveillance. His primary responsibility is to provide the appropriate monitoring to ensure the safe conduct of field operations. He will have access to continuous communications with the Command Post. The number of Assistant HSO's will be dependent upon the number of downrange operations occurring simultaneously, site level of protection designation, and the individual assignments made by the HSO. The Assistant HSO will also share responsibility with the Field Operations Lead and the HSO for ensuring that all safety practices are utilized by downrange teams and that during emergency situations appropriate procedures are immediately and effectively initiated. He will also be responsible for the control of specific field operations and all related activities such as personnel decontamination, monitoring of worker heat or cold stress, distribution of safety equipment, and conformance with all other procedures established by the HASP.

3.0 SITE HISTORY AND PHYSICAL DESCRIPTION

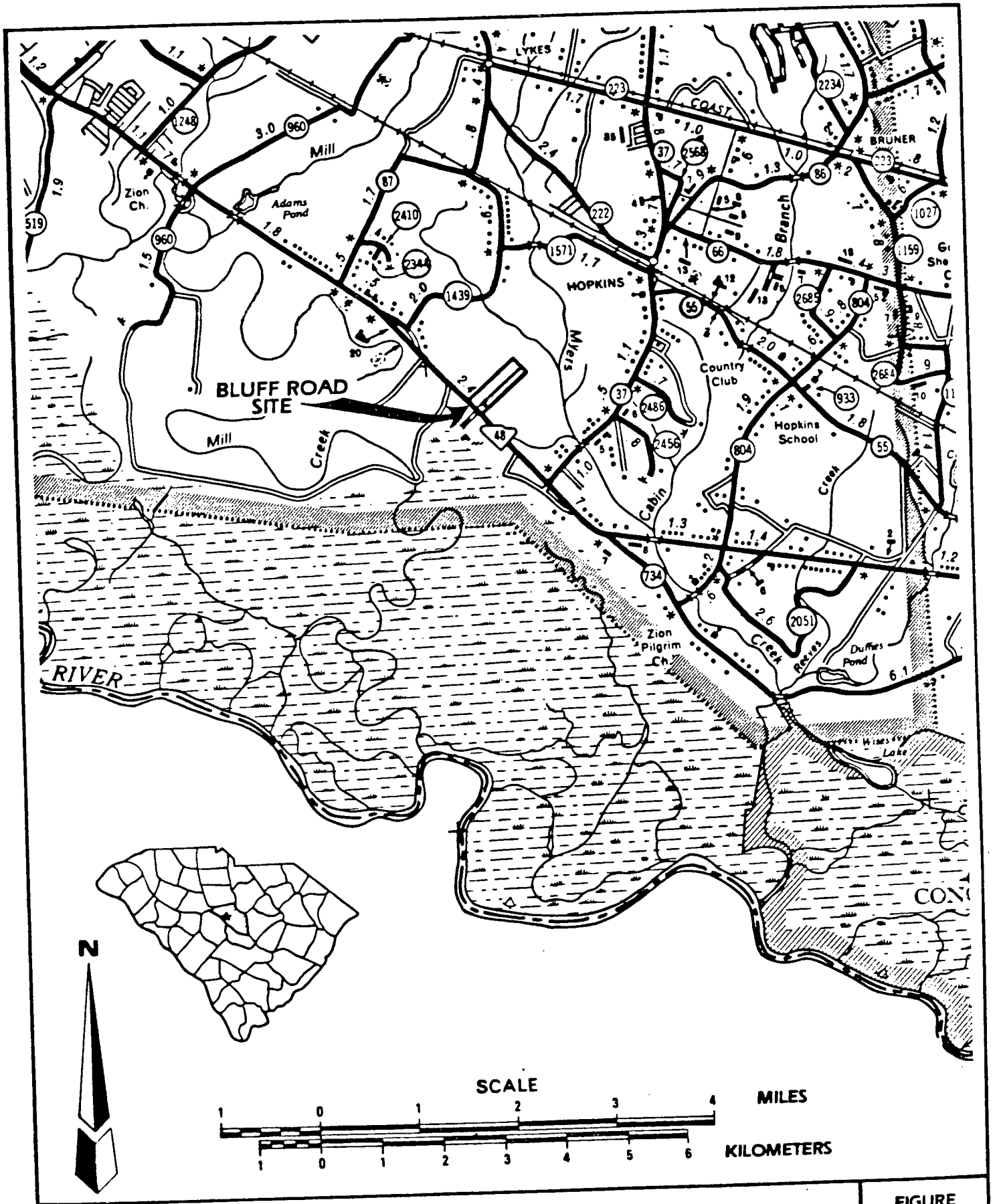
3.1 LOCATION

The Bluff Road site in Richland County, South Carolina, is approximately 10 miles southeast of Columbia, South Carolina (Figure 3-1). The area around the 2-acre site, from Bluff Road to Myers Creek at South Carolina State Road 77, is a wooded, slightly swampy area.

Directly across State Highway 48 (Bluff Road) from the Bluff Road site is the main entrance to the Westinghouse Nuclear Fuel Plant, whose buildings are located 1/4 mile from the highway. The company assembles fuel rods for nuclear power plants.

3.2 DESCRIPTION

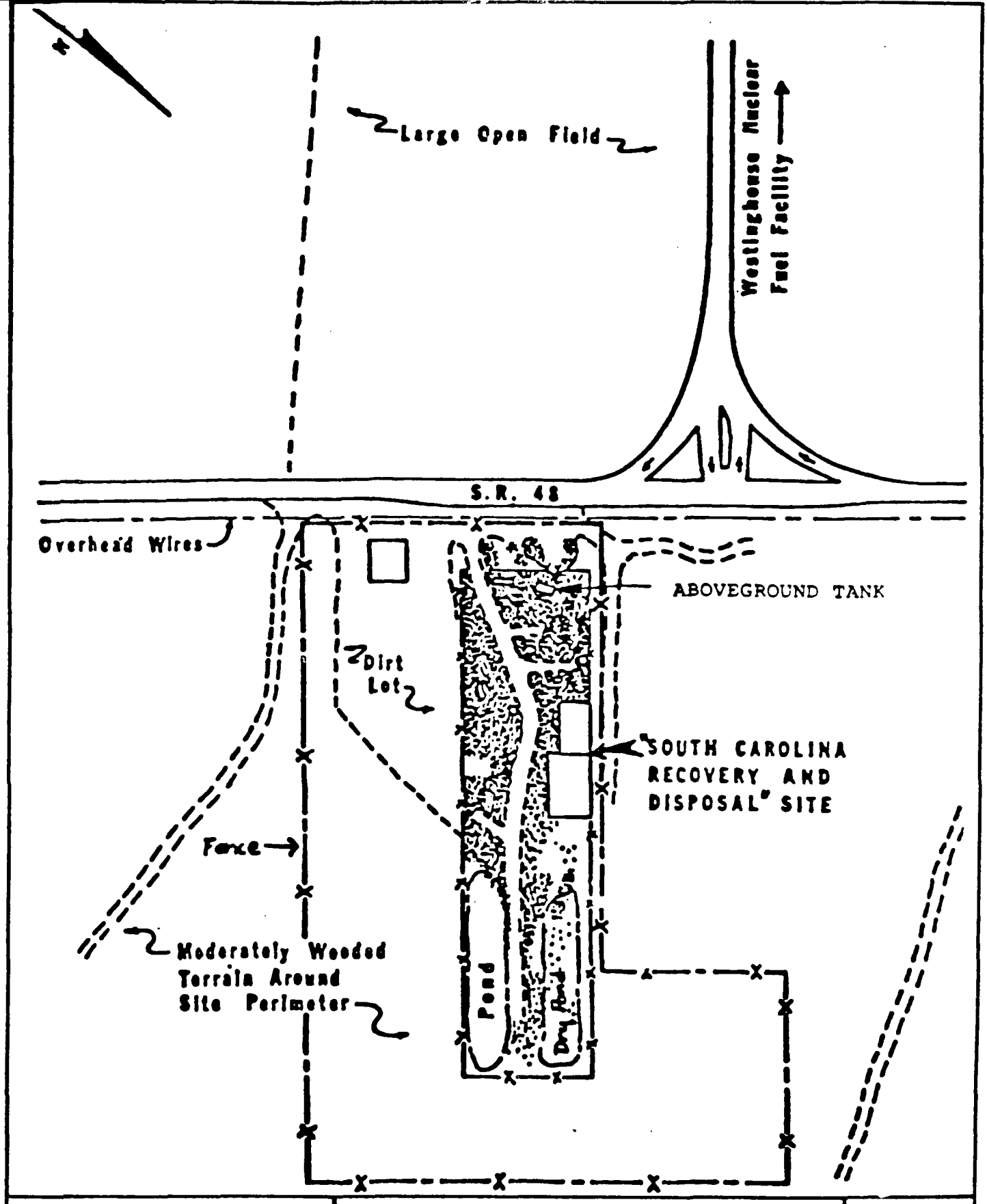
As shown in Figure 3-2, the site is characterized by an old abandoned concrete blocked garage and an adjacent burned out



REM III
LOCATION MAP
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE
1-1

EBASCO



SITE LAYOUT

EBASCO

EBASCO SERVICES INCORPORATED

Figure 1-2

home. The original entrance to the site was covered with a protective layer and sand filled. The front gate and fence is located approximately 30 yards from the highway.

Two small lagoons located at the northern end of the site are remnants of the lime slurry disposal ponds used by the acetylene manufacturer that once occupied the property. The western pond contains dried lime and is usually dry; the eastern pond usually holds water at a depth of about 30 centimeters (cm). An old aboveground storage tank contains high levels of phenolic compounds. The old storage area is surrounded by a chain-linked fence. There is no telephone or electricity onsite at present but power and telephone lines run nearby so they can be hooked up.

An intermittent stream is continuous from the Bluff Road site to Myers Creek. The upper end of the intermittent stream has drainage ruts radiating from it. Apparently, the ruts were installed many years ago to help drain the area for logging.

3.3 HISTORY

The site was operated by South Carolina Recycling and Disposal, Inc. (SCRDI) as a storage, recycling, and disposal facility for waste chemicals from 1976 to 1982. A site visit in March 1980 by the United States Environmental Protection Agency (EPA) revealed leaking containers of volatile organic compounds. Chemicals were reportedly observed leaking from the drums into drainage ditches and the onsite lagoons. Analysis by the EPA, of drainage ditch sediments indicated the presence of organic compounds, halogenated organics, pesticides, and metals.

A groundwater investigation was performed by the South Carolina Department of Health and Environmental Control (SCDHEC) in the fall of 1980. Groundwater samples revealed elevated levels of chlorinated organic solvents and lead. Resampling in August 1982 indicated that concentrations of organic compounds in the groundwater were increasing (SCDHEC, 1981).

Preliminary cleanup of the site was performed in 1982 and 1983. Drums of chemicals and contaminated soil were removed and many areas were covered with gravel to provide clean roads. The onsite lagoon, material adjacent to the lagoon identified as lime, and a large aboveground tank remained onsite. Some reports indicate that an underground tank also remains onsite,

however, this is not certain. An area in the rear of the site was cleared and used for detonation of shock-sensitive materials during the site cleanup. This area is referred to as the demolition area (Golder Associates, 1986). The location of the detonation area was not depicted on the site maps in the RI report.

Golder Associates was employed by SCDHEC to conduct a Remedial Investigation (RI) to determine the type, extent, and degree of soil and groundwater contamination on and around the site. In 1985, soil, lagoon water and sediment, sludge from the aboveground tank, and groundwater samples were collected for chemical analysis.

Analysis of composite soil samples for priority pollutant compounds detected primarily volatile organics and some metals. The water samples from the lagoon revealed no priority pollutant organic compounds, but toxic metals were present. Sediment from the lagoon samples showed the presence of toxic metals contamination and slight organic contamination. Sludge samples from the aboveground tank onsite had high concentrations of phenolic compounds. The groundwater analysis revealed nine primary volatile organic pollutants. Analysis of samples of surface water from various runoff points around the site have shown inconclusive results.

4.0 SITE RELATED INCIDENTS, COMPLAINTS, AND ACTIONS

There are no unknown site related incidents or complaints at Bluff Road Site according to information available.

5.0 WASTE DESCRIPTION/CHARACTERIZATION

The following information is presented in order to identify the types of materials that may be encountered at the Bluff Road Site. The detailed information on these materials was obtained from National Fire Codes, 1985, Volume 7 of NFPA and Dangerous Properties of Industrial Materials, Sixth Edition, SAX.

5.1 CERCLA HAZARD RATING DEFINITIONS

Substance	Health	Flammability	Reactivity
Chlorobenzene	2	3	0
Trichloroethylene	Carcin 2	1	0
Methylene Chloride	3	2	2
1,1,1-Trichloroethane	Carcin 2	1	0
Chloroform	Carcin 3	0	0
Ethylbenzene	2	3	0
Toluene	Carcin 2	3	0
Benzene	Carcin 2	3	0
Zinc	*	0	0
Copper	*	0	
Chromium	*	0	
Arsenic	Carcin	0	
Magnesium	*	0	
Nickel	Carcin	0	

*Hazard will relate to state of element (i.e., Cr(III) vs. CR(VI)

5.2 WASTE TYPES

Liquid __X__ Solid _____X___ Gas __X__
Sludge __X__ Semi-solid _X___ Other____

5.3 CHARACTERISTICS

Corrosive _____ Flammable __X___
Explosive _____ Volatile ___X___
Radioactive _____ Inert_____X___
Other _____

5.4 CONTAINMENT

Pit _____ Pond _____ Lagoon __X__
Lake ____ Process Vessel _____
Tank __X__ Piping _____ Drum _____
Tank Car _____ Lab Pack _X__
Other ___X____

5.5 DESCRIPTION OF "OTHER" FOUND IN 5.2, 5.3 and 5.4.

A shock sensitive containment shed is located toward the rear of the site.

6.0 HAZARD ASSESSMENT

The contaminants of concern at the Bluff Road Site are volatile organic compounds such as benzene, methylene chloride, 1,1,1-trichloroethane, chloroform, and toluene. Inorganic constituents including zinc, copper, chromium, magnesium, nickel, and arsenic are also present in different matrices in the contaminated area.

The sludge in the aboveground tank has exhibited concentrations of 2-chlorophenol as high as 33,300 ppm (Golder Associates, 1986). Concentration of organic vapors leaving the tank has been measured in the past at 50-60 ppm (Golder Associates, 1985). Although the tank contents are a health concern, no activities are planned around the tank. The area around the tank will be delineated as off limits to all personnel.

Table 1 provides maximum concentrations of compounds detected at the Bluff Road site.

Table 2 illustrates pertinent toxicological data for the compounds that have been detected in past analysis. For all compounds, the primary working exposure concerns are inhalation (of dust for nonvolatile compounds and of vapor for volatile compounds) and skin contact/absorption.

By far, the predominant compounds are the volatile organic compounds listed in Table 1. Odor thresholds are listed in Table 1; odor characteristics for the volatile organic compounds follow:

- Chlorobenzene - sweet, almond odor.
- Trichloroethylene - sweet odor.
- Chloroform - pleasant, sweet odor.
- Methylene chloride - pleasant, sweet odor.
- 1,1,1-trichloroethane - mild, chloroform-like odor.
- Ethylbenzene - sweet, gasoline-like odor.
- Toluene - pleasant odor, benzene-like.
- Benzene - aromatic odor.

7.0 TRAINING

7.1 BASIC TRAINING REQUIRED

All personnel conducting work at the Bluff Road site will be enrolled in a medical monitoring program prior to commencing work at the site. Additionally, all personnel will have attended 40 hour OSHA-approved Personal Protection and Safety Training or its equivalent.

TABLE 1

Maximum Contaminant Concentrations

Organics	Matrix	Concentration (ppm)
Trichloroethylene	S	0.11
	W	5.28
Methylene Chloride	S	4.29
	W	10.0
1,1,1-Trichloroethane	S	1.68
	W	30.6
Chlorform	S	0.37
	W	3.79
Toluene	S	1.08
	W	2.41
Inorganics		
Zinc	B	9.4
	D	23.0
Copper	B	3.8
	D	7.6
Chromium	B	5.0
	D	13.0
Arsenic	B	19.8
Magnesium	B	170.0
	D	480.0
Nickel	B	17.0
	D	39.0

S= Soil
W= Groundwater
D= Drainage Ditch Sediment
B= Lagoon Sediment

TABLE 2
TOXICOLOGICAL DATA FOR COMPOUNDS PREDOMINANT IN PAST ANALYSES

Compound	Matrix Found	IP[a]	PEL[b]	TLV[b]	Odor Threshold[b] (ppm)	IDLH[b] (ppm)
Volative Organic Compounds						
Chlorobenzene	S	9.07	75	75	0.21	2400
Trichloroethylene	S/W	9.47	100	50	50	1000 Ca
Methylene Chloride	S/W	11.35	500	100	307	5000
1,1,1-Trichloroethane	S/W	---	350	---	400	1000 Ca
Chloroform	S/W	11.42	50[c]	10	200	1000 Ca
Ethylbenzene	S	8.76	100	---	140	2000
Toluene	S/W	8.82	200	100	0.17	2000 Ca
Benzene	S	9.25	0.05	10	31	2000 Ca
Inorganic Compounds (mg/m^3)						
Zinc	B/D	---	5[c]	10[c]	---	---
Copper	B/D	---	1	---	---	---
Chromium	B/D	---	0.5	---	---	250 mg/m^3
Arsenic	B	---	0.01	0.2	---	Ca
Magnesium	B/D	---	15[d]	10[d]	---	---
Nickel	B/D	---	1	1	---	Ca

Note: Material referenced from NIOSH pocket guide to Chemical Hazards and Chemtox.

Ionization potential (eV)
PEL (ppm) = Permissible Exposure Limit. Occupational Safety and Health Administration (OSHA) 1983 set 8-hour time weighted average concentrations allowable in any 8-hour wo shift of a 40-hour work week which shall not be exceeded for exposure to airbor contaminants. Inorganics reported as mg/m^3.
TLV (ppm) = Threshold Limit Value. Estimate at average safe toxicant concentration that can be tolerated on a regular basis. Inorganics reported mg/m^3.
Oxide form
Oxide fume

= Lagoon sediment
= Treated as a carcinogen to man
D = Drainage Ditch Sediment
S = Contaminants in soil
= Contaminants in water

Training or training and site experience must also conform to the requirements of 29 CFR 1910.120.

7.2 ADVANCED TRAINING

Advanced Training as necessary will be provided to any personnel who will be expected to perform site work utilizing Level B protection or other specialized operation to be undertaken at a site.

7.3 SITE-SPECIFIC TRAINING

Training will be provided that will specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

7.4 SAFETY BRIEFINGS

Project personnel will be given briefings by the HSO or Assistant HSO on a daily or as needed basis to further assist site personnel in conducting their activities safely. It will be provided when new operations are to be conducted, changes in work practices to be implemented due to new information made available, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices when performance deficiencies are identified during routine daily activities or as a result of safety audits.

7.5 FIRST AID AND CPR

The RHSS will identify those individuals requiring this training in order to ensure emergency treatment is available at field activities. These courses will be consistent with the requirements of the American Red Cross Association.

7.6 JOB SAFETY AND HEALTH PROTECTION

The OSHA poster (Figure 7-1) or a facsimile must be posted at each site command trailer and each mobile lab trailer or

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If, upon inspection, OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

other conspicuous place where notices to employees are customarily posted. It promotes safe and healthful working conditions at appropriate job sites throughout the nation.

8.0 ZONES, PROTECTION, AND COMMUNICATION

8.1 SITE ZONES

In areas where site personnel will be conducting invasive operations, a restricted area will be clearly marked or identified. For these operations the restricted area will be established as a three foot or greater radius around the operation. Other restricted areas may include storage areas, sources of combustible gases or air contaminants, and other dangerous areas identified during the conduct of the remedial investigation. Access for emergency services to areas for specific site work will be established where necessary in order to provide for rapid access.

It is anticipated that the Command Post will be an onsite office which will be equipped with the appropriate support and safety equipment. Safety equipment will include emergency eyewash, fire extinguishers, stretcher, first aid kit, air horn, and other appropriate equipment. The contamination reduction zone (CRZ) is identified as a specific area adjacent to the support zone and to be utilized for personnel and equipment decontamination. The restricted area (the exclusion zone and the CRZ) will be identified and isolated in such a way as to provide for full public safety and to preclude interference with operations by vehicles and pedestrians. Within the exclusion zone there will be mini-decon/break areas. These areas will contain boot and glove washes, and may have water and Gatorade available if appropriate. The work area/zones will utilize existing barriers as well as ropes, barricades and other similar means to establish and isolate the work area.

8.2 PERSONAL PROTECTION

8.2.1 General

The level of protection to be worn by field personnel will be defined and controlled by the HSO with approval of the RHSS. Basic levels of protection for general operations in conformance with Occupational Safety and Health Administration (OSHA) Standards including 29 FR 1910 and 30 CFR 11, EPA Region IV Standard Operating Procedures (SOP) for Field Health and Safety, as well as all other applicable Federal, State and local regulations. Where more than one hazard area is indicated, further definition shall be provided by review of site hazards,

conditions, and proposed operational requirements and by monitoring at the particular operation being conducted. Protection may be upgraded or downgraded, as appropriate, only after the HSO receives authorization from the PRPs RHSS.

Field changes will utilize a "Field Change Request" for documentation and approval. See Figure 8-1.

Activity	Level of Protection
Temporary Borings for Water Sampling	B/C/D (Mod.)
Well Inventory	D
Groundwater Testing	D (Mod.)
Surface/Subsurface Soil Sampling	B/C/D (Mod.)
Monitor Well Installation (Groundwater)	D (Mod.)
Surface Water Runoff Sampling	D (Mod.)
Aquatic Biota Investigation	D (Mod.)

For the purposes of this Health and Safety Plan the levels of protection are described below:

Level D - This is the basic work uniform and its components including coveralls, safety boots/shoes, safety glasses (optional), hard hat with optional face shield, and chemical resistant type gloves.

Modified Level D - This level of protection is required for all activities described above (except one) for greater protection due to specific characteristics of the sampling locations. Its components include all of level D's components plus a polycoated Tyvek and an Air Purifying Respirator (APR) - available but not worn. High efficiency particulate/organic cartridges will be available. The donning of the APR may be directed by the HSM/HSO/AHSO in the event of dusty conditions where the FID/PID indicates 0.5 ppm pm or more of particulates in the ambient air or the FID/PID indicates greater than 5 ppm backgroundd. Work will be stopped to consider level B protection.

8.2.2 Initial Levels Of Protection

Initial levels of protection will be employed during the performance of the Initial Reconnaissance. The reconnaissance team is anticipated to consist of a minimum number of personnel. The HSO, the Site Manager or Site Project Engineer, and other appropriate support personnel may be required. The team will enter hazardous areas and spill locations in

Figure 8-1

FIELD CHANGE REQUEST

EPA Work Assignment No. | **Work Charge Number** | **Field Charge No.**

FCR

To_____ **Location**_____ **Date**_____

Description:

Reason For Change:

Recommended Disposition:

Field Operations Leader (Signature) **Date**

Disposition:

Site Manager **Date**

Distribution: **Regional Manager** **Others as required**_____
Quality Assurance Manager _____
Site Manager _____
Field Operations Leader _____

conservatively-specified protection with appropriate monitoring equipment. The Initial Reconnaissance will allow for the selection of appropriate protection levels for planned operations, decontamination procedures, site layout, sampling strategies, and general safety planning. It should be noted that this HASP allows for upgrading or downgrading of protection levels to conservatively preclude any potential for contamination while not sacrificing protection or efficiency. During the Initial Reconnaissance, the team will perform various monitoring techniques to identify the presence of contaminants as well as assessing the integrity of the site in consideration of safety for the proposed site investigation, sampling, or construction operations. Careful attention shall be paid to conform to requirements of 29 CFR 1910.120(c) relating to Site Characterization and Analysis.

8.2.3 Safety Equipment

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRC, as appropriate. This shall include HASP-specified communications, first aid kit, emergency eyewash or emergency shower or drench system, fire extinguishers, and other safety-related equipment. Also located in the Support Zone or the CRZ will be a backup field team when required to support downrange field teams. Other safety equipment will be located at the site of specific operations, (e.g., a drilling rig), as appropriate.

8.3 COMMUNICATIONS

- Telephones - A telephone may be located in the Command Post trailer in the Support Zone for communication with emergency support services/facilities.

- Air Horns - These will be carried by downrange field teams and also will be maintained at the Support Zone for announcing emergency evacuation procedures (see Section 14.0) and backup for other forms of communications.

- Hand signals - To be employed by downrange field teams along with utilizing the buddy system. These signals are also very important when working with heavy equipment. They shall be known by the entire field team before operations commence and covered during site-specific training.

9.0 MONITORING PROCEDURES

9.1 MONITORING DURING SITE OPERATIONS

All site environmental monitoring should be accompanied by meteorological monitoring of appropriate climatic conditions.

9.1.1 Drilling Operations

Monitoring will be performed continuously by the HSO during the conduct of work. A photoionization detector (PID) and/or flame ionization detector (FID) equipped organic vapor meter will be utilized to monitor the breathing zone, the borehole, and all geological samples upon their retrieval. Results of these monitorings will be recorded in a field log book. Drill cuttings will also be monitored. A combustible gas indicator (CGI) with oxygen alarm will be used to monitor the borehole for the presence of combustible gases. Similar monitoring of any fluids produced during well development will also be conducted.

9.1.2 Excavation Operations

If the CGI indicates a reading off >10% of the LEL, the workers will shift to supplied air. If the CGI is >20%, the area will be immediately evacuated.

9.2 MEDICAL SURVEILLANCE PROCEDURES FOR EVIDENCE OF PERSONAL EXPOSURE

All personnel and subcontractors who will be performing field work at the Bluff Road Site will be required to have passed a medical surveillance examination or equivalent. A release for work will be confirmed by the PRP's RHSS before an employee can begin hazardous activities. The exam will be taken annually at a minimum and upon termination of work. Additional medical testing may be required by the PRP's RHSS in consultation with the company physician and the HSO if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance. This site requires no specific medical tests beyond the basic physical as stated in Federal guidelines 49 CFR 1910.120.

10.0 SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.1 GENERAL

All field sampling will be performed under the level of protection described in Section 8. Particular concern should be given under windy conditions as dust may contain inorganic carcinogens along with other contaminants. The HSO/HSM/AHSO should require the use of APRs and protect the skin from exposure under dusty conditions. Further attention should be given to sewer and electrical lines, underground conduits and sample handling requirements. Contamination avoidance will be practiced to avoid unnecessary contamination and subsequent decontamination.

Chemical resistant boots and Tyvek^{R} suits must be worn where potential contact with contaminated soils and/or water may occur. Also, chemical resistant gloves should be worn during all sampling activities. In addition to chemical resistant boots and gloves, outer boots and gloves should be used to facilitate decontamination procedures. Full face air purifying respirators (APRs) shall be available. The APRs shall be fitted with Mine Safety and Health Administration/National Institute for Occupational Safety and Health (MSHA/NIOSH) approved high efficiency particulate organic vapor cartridges. Ambient dust, FID/PID readings, will determine the need for APRs. Sustained visible dust would indicate windy conditions and may warrant a review of sampling activities to reduce exposure (i.e., local wetting of soils).

Precautions will be taken against the potential for heat and cold stress. Some of these precautions include adjusting work schedules, providing shelter or shaded areas and maintaining workers' body fluids by urging them to drink liquids. Since the scheduled period of work is in the spring, severe heat or cold conditions are not expected to occur.

11.0 DECONTAMINATION PROCEDURES

All personnel and equipment exiting the exclusion zone shall be thoroughly decontaminated. Heavy equipment, if utilized for operations where it may be contaminated, will have prescribed decontamination procedures to prevent hazardous materials from leaving the site. They may include excavating a shallow pit to collect waste cleaning solution and screens, if required, to prevent the spread of air contaminants. The pit will be

cleaned, wastes disposed of, filled in, and covered with clean soil when its use is terminated. The surface area of the pit shall be sufficient to accommodate the washwater generated by the largest piece of machinery. Equipment needed may include a stream generator with high pressure water, empty containers, screens, screen support structures, and shovels.

Decontamination procedures for personnel and equipment shall be conducted at each site prior to exiting the perimeter of the established exclusion zone.

Figure 11-1 describes the personnel decontamination procedure. Outer, more heavily contaminated items (e.g., outer boots and gloves) should be decontaminated and removed first, followed by inner, less contaminated items. Decontamination of outer items will consist of removal of gross soil contamination prior to disposal. Decontamination of inner items will consist of removal of excessive dust with a water spray bottle or disposable wet towels. When not in use, APRs should be kept in closed plastic bags to avoid contamination. After use of APRs, filter cartridges should be removed and the facepiece should be washed with water and disinfectant and towel dried. Tyvek® suits should be removed by rolling down the body with the suit inside out. Bathing should occur after end of shift.

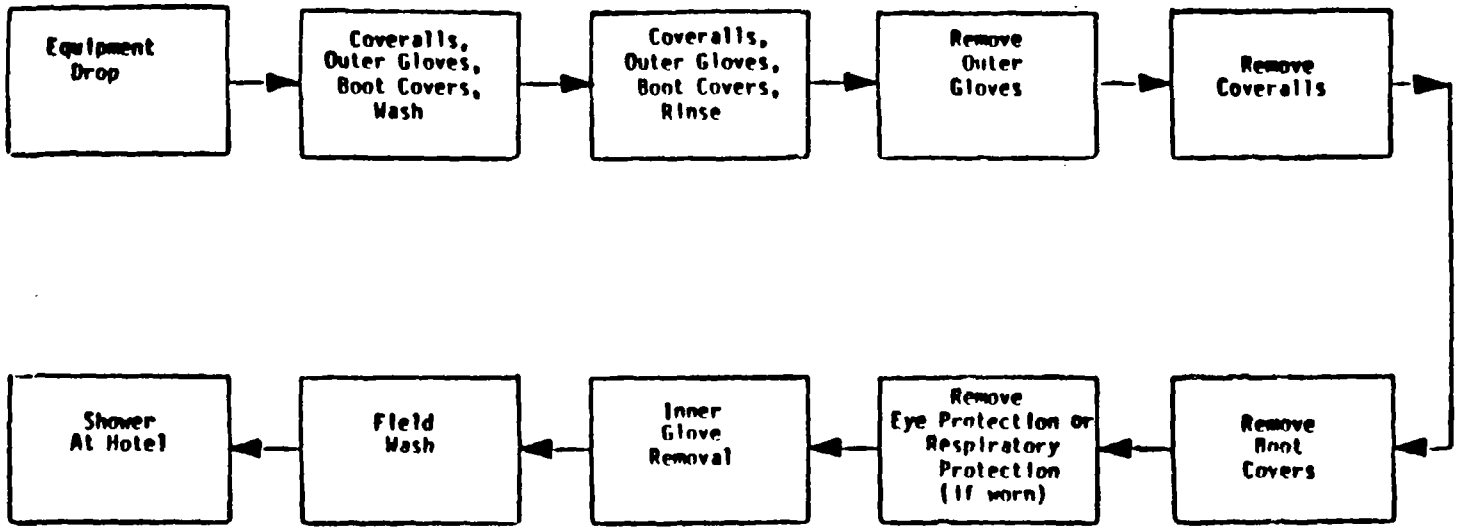
Sampling equipment should be decontaminated by removing gross soil contamination and washing with spray bottle. Augers from the drilling rig should be wrapped in a plastic sheet and taken to a decontamination station to be properly decontaminated with water. The rig itself should be decontaminated by removing any gross soil contamination on it prior to leaving the sampling site.

12.0 ADDITIONAL WORK PRACTICES

No additional work practices are anticipated.

13.0 DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. All potentially contaminated materials, (e.g., clothing, gloves, etc.), will be bagged or drummed as necessary and segregated for disposal. All



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PERSONNEL DECONTAMINATION PROCEDURES

FIGURE 11-1.

contaminated waste materials shall be disposed of as required by the provisions included in the contract and consistent with REM III and regulatory provisions. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

All potentially contaminated materials (e.g., outer boots and gloves, Tyvek® suits, towels, etc.) should be bagged and placed in heavy duty plastic garbage cans with lids. All waste materials shall be disposed of as hazardous materials according to appropriate regulations.

Drill cuttings and other excavated contaminated soil may be left onsite.

14.0 EMERGENCY PLAN

As a result of the hazards on site, and the conditions under which operations are conducted, the development of an emergency situation is a possibility

Individual site characteristics will determine preliminary action to be taken to assure that this emergency plan may be successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment and to the relative possibility of site fire, explosion or release of vapors or gases which will impinge on these neighbors. If there is even a remote possibility of any of these occurrences, the Site Manager must coordinate the neighborhood interface with his Regional Manager, the Community Relations Coordinator, the RHSS and the HSM.

The Site Emergency Coordinator is:

Field Operations Leader _____
or
HSO (Alternate) _____

The emergency coordinator shall make contact with local fire, police and other emergency units prior to beginning work on site. In these contacts the emergency coordinator will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these

contaminants. Also at this time the emergency coordinator and the emergency response units shall make arrangements to handle any emergencies that might be anticipated.

The emergency coordinator shall implement the contingency plan whenever conditions at the site warrant such action. The coordinator will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units.

14.1 EVACUATION

In the event of an emergency situation, such as fire, explosion, significant release of toxic gases, etc.; an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All personnel in both the restricted and nonrestricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the emergency plan. The location shall be upwind of the site as determined by the wind direction indicator. For efficient and safe site evacuation and assessment of the emergency situation, the Emergency Coordinator will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO or Assistant HSO must see that access for emergency equipment is provided and that all combustion apparatus has been shut down once the alarm has been sounded. Once the safety of all personnel is established the Columbia, South Carolina Fire Dept. and other emergency response groups will be notified by telephone of the emergency.

14.2 POTENTIAL OR ACTUAL FIRE OR EXPLOSION

In the event of potential fire or explosion (LEL values >20% in the work zone), or if an actual ire or explosion has taken place, immediate evacuation of site (air horn will sound for 10 second intervals) will occur, and local fire and police department, and other appropriate emergency response groups will be notified.

Fire Dept. - (803) 252-2911
Police Dept. - (803) 252-2911

14.3 PERSONNEL INJURY

Emergency first aid shall be applied onsite as deemed necessary. Then, decontaminate and transport the individual to nearest medical facility if needed. The HSO will supply medical data sheets to appropriate medical personnel and complete the incident report designated in HS-1.12 (Attachment A).

Hospital - (803) 771-5050 (Baptist Hospital)
Rescue - (803) 252-2911

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, a hospital route must be firmly identified. The hospital route location map shall also be provided in the HASP as well as conspicuously posted on site.

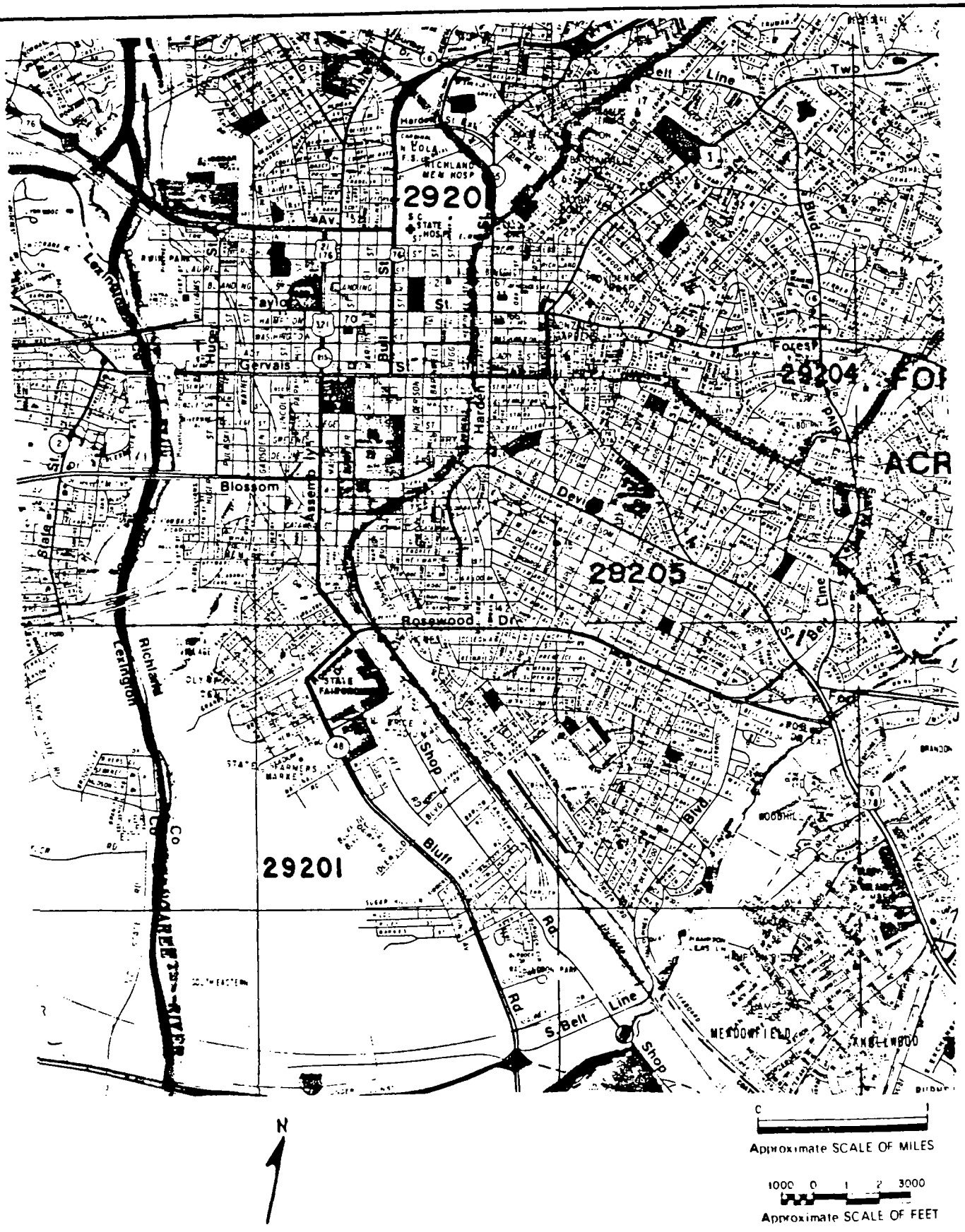
Primary Hospital Route: (see Figure 14.1, Hospital Route) Take Bluff Road toward Columbia, continuing past the State fair grounds. Turn left at McDonald's restaurant onto Assembly Road. Turn right onto Taylor Street; go two lights and turn right again. Baptist Hospital is at the corner.

Backup Hospital Route: (also see Figure 14.1) Proceeding to Taylor Street as described for the primary hospital route, Richland Memorial Hospital is located approximately 15 blocks north of Baptist Hospital. Continue in an easterly direction on Taylor for blocks to Bull Street. Turn left and go approximately 8 blocks to Richland Memorial Hospital on the right.

14.4 OVERT PERSONNEL EXPOSURE

Include generic first aid procedures in this section. Typical response includes:

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eyewash and emergency shower or drench system will be provided onsite at the CRZ and/or Support Zone as appropriate. Eyes should be rinsed for 15 minutes upon chemical contamination.



Hospital Routes

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14-1

INHALATION:	Move to fresh air and/or, if necessary decon/transport to hospital.
INGESTION:	Decontamination and transport to emergency medical facility
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility. HSO will provide medical data sheets to medical personnel as requested (see Section 16.0).

14.5 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the HSO will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold related injuries
- Treacherous weather-related working conditions
- Limited visibility
- Potential for electrical storms

15.0 AUTHORIZATIONS

Personnel authorized to enter the Bluff Road Site while operations are being conducted must be certified by the PRP's RHSS. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.10 and review and sign-off of this HASP. All personnel must utilize the buddy system or trained escort, and check in with the Field Team Leader at the Command Post.

1. PRP's Personnel Authorized to Perform Work Onsite:

    1. _____
    2. _____
    3. _____
    4. _____
    5. _____
    6. _____
    7. _____
    8. _____
    9. _____

2. Other Personnel Authorized to Enter Site:

    1. EPA Personnel
    2. State Environmental Personnel
    3. Police, Fire, Emergency Personnel
    4. S.C. State environmentalists associated with Bluff Road Site/Project.
    5. Authorized Subcontract Personnel

16.0: MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all onsite personnel and will be kept in the Command Post during the conduct of site operations. Completion is required in addition to compliance with the Medical Surveillance Program requirements described in the Health and Safety Plan. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next of Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses _____
or Exposures to Hazardous Chemicals

_____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

Name, Address, and phone number of personal physician:_____

_____

_____

_____

_____

17.0 FIELD TEAM REVIEW

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provisions contained therein.

Site/Project: _____

Name Printed	Signature	Date

18.0 APPROVALS

By their signature the undersigned certify that this HASP is approved and will be utilized at the Bluff Road site.

Health and Safety Officer	Date
Site Manager	Date
Company Health and Safety Supervisor	Date
Company Designated Lead	Date
Company Health and Safety Manager	Date

ATTACHMENT A

HAZARDOUS SUBSTANCE INFORMATION FORM

COMMON NAME:_____ CHEMICAL NAME:_____

1. PHYSICAL/CHEMICAL PROPERTIES

		SOURCE
Natural physical state: Gas___ Liquid____ Solid____ (at ambient temps of 20°C-25°C)		_____
Molecular weight	_____g/g-mole	_____
Density[a]	_____g/ml	_____
Specific gravity[a]	_____@_____°F/°C	_____
Solubility: water	_____@_____°F/°C	_____
Solubility[b]:_____	_____@_____°F/°C	_____
Boiling point	_____°F/°C	_____
Melting point	_____°F/°C	_____
Vapor pressure	_____mmHg @_____°F/°C	_____
Vapor density	_____@_____°F/°C	_____
Flash point (open cup____; closed cup)	_____°F/°C	_____
Other:_____		_____

2. HAZARDOUS CHARACTERISTICS

A. TOXICOLOGICAL HAZARD

	HAZARD?	CONCENTRATIONS (PEL, TLV, other)	SOURCE
Inhalation	Yes No	_____	_____
Ingestion	Yes No	_____	_____
Skin/eye absorption	Yes No	_____	_____
Skin/eye contact	Yes No	_____	_____
Carcinogenic	Yes No	_____	_____
Teratogenic	Yes No	_____	_____
Mutagenic	Yes No	_____	_____
Aquatic	Yes No	_____	_____
Other:_____	Yes No	_____	_____

B. TOXICOLOGICAL HAZARD

	HAZARD?	CONCENTRATIONS	SOURCE
Combustibility	Yes No	_____	_____
Toxic byproducts(s):	Yes No		
_____		_____	_____
_____		_____	_____
Flammability	Yes No		
LPL		_____	_____
UFL		_____	_____
Explosivity	Yes No		
LEL		_____	_____
UEL		_____	_____

_____

[a] Only one is necessary.

[b] For organic compounds, recovery of spilled material by solvent extraction may require solubility data.

C. REACTIVITY HAZARD

	HAZARD? Yes No	CONCENTRATIONS	SOURCE
Reactivities:			
_____		_____	_____
_____		_____	_____

D. CORROSIVITY HAZARD

	HAZARD? Yes No	CONCENTRATIONS	SOURCE
pH_____			
Neutralizing agent:		_____	_____
_____		_____	_____
_____		_____	_____

E. RADIOACTIVE HAZARD

	HAZARD? Yes No	EXPOSURE RATE	SOURCE
Background	Yes No	_____	_____
Alpha particles	Yes No	_____	_____
Beta particles	Yes No	_____	_____
Gamma radiation	Yes No	_____	_____

3. DESCRIPTION OF INCIDENT:

Quantity involved_____
Release information_____
_____
Monitoring/sampling recommended_____
_____

4. RECOMMENDED PROTECTION

Worker_____
_____
Public_____
_____

5. RECOMMENDED SITE CONTROL:

Hotline_____
_____
_____
Decontamination line_____
_____
Command Post location_____
_____

6. REFERENCES FOR SOURCES:

_____
_____
_____
_____